

FT Wayne Refuse Disposal



SOLID WASTE "CUBETTES AS FUEL"

**APPLICATION FOR
RESOURCE RECOVERY SYSTEM DEMONSTRATION GRANT**

FEDERAL ENVIRONMENTAL PROTECTION AGENCY

G. A. D. 801568

**City of Fort Wayne
Indiana**

July 15, 1972

Submission Responding
to March 24, 1972
FEDERAL - EPA

"REQUEST FOR RESOURCE RECOVERY SYSTEMS DEMONSTRATION GRANT"

Beneficiated Solid Waste Cubettes As
Salvage Fuel For Municipal Steam - Electric Generation

C.A.F. (Cubettes As Fuel)

CITY OF FORT WAYNE, INDIANA
July 15, 1972



THE CITY OF FORT WAYNE

July 15, 1972

Grants Operation Branch
Grants Administration Division
Environmental Protection Agency
Washington, D.C. 20460

E.P.A. - Resource Recovery Systems Demonstration Grant Application
CUBETTES AS FUEL - "C.A.F." G.A.D. #801568

Gentlemen:

Responding to the letter of June 15, 1972 from Mr. Arsen J. Darnay, Director of the E.P.A. Resource Recovery Division, we are pleased to submit this completed application with supporting documentation for our proposed Fort Wayne Resource Recovery System, entitled:

"Beneficiated Solid Waste Cubettes as Salvage Fuel
for Municipal Steam - Electric Generation"

- or -

Cubettes as Fuel - "C.A.F."

As suggested, we have amplified our submission to include the specific items listed in Mr. Darnay's letter, and feel that they are all now adequately covered. Supporting documentation of our previous economic and technical feasibility studies is included, as well as discussion on extruder equipment and cubette analyses.

The response and continued support from all sections of our Society has been overwhelming and further confirms the viability of our resource recovery system for more effectively coping with the pressing problems of solid waste disposal, environmental degradation, conservation of resources and satisfying our increasing energy needs.

Unlike many of the conceptual systems promoted, the Fort Wayne Program draws upon the established expertise of the Secondary Materials Industry and utilizes their significant private investment in existing recycling facilities, by only adding an additional phase to them, and thereby further increasing the quantity of materials which can be economically recovered from the wastes of the community.

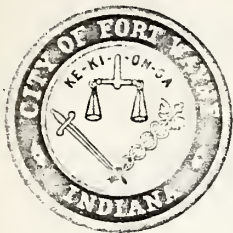
We would be pleased to have our officials and engineers meet at your convenience to answer any questions regarding this application.

The time, guidance and courtesies which have been extended by J. Robert Holloway and other members of the E.P.A. staff have been very much appreciated.

Yours very truly,

BOARD OF PUBLIC WORKS


Ronald L. Bonar
William J. Winters



THE CITY OF FORT WAYNE

May 4, 1972

Grants Operation Branch
Grants Administration Division
Environmental Protection Agency
Washington, D.C. 20460

Re: Resource Recovery Systems Demonstration Grant Application

Gentlemen:

In response to the invitation letter of March 24, 1972 from Richard P. Lonergan (with a pre-application packet) drawing our attention to your RFP which appeared in March 24, 1972 issue of the Commerce Business Daily regarding

"Request for Resource Recovery Systems Demonstration
Grant Preproposals"

we are pleased to submit the required completed pre-application and supporting documentation.

Essentially, our submission addressed to the mounting burden of solid waste disposal, the ominous "energy crises" and the appeal for resources recovery and environmental enhancement, has stimulated this multi-faceted approach for solutions in the Greater Fort Wayne area.

The Fort Wayne Program holds great promise for:

- conversion of a relegated combustible fraction of the solid waste stream into a "controlled quality salvage fuel" with physical characteristics necessary to permit amenable handling and prolonged storage to afford practical consumption on an "as fuel needed" basis.

May 4, 1972

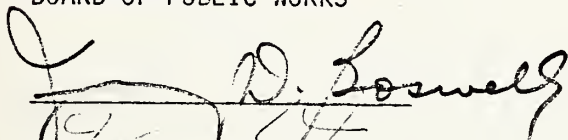
- lower thermal energy costs through use of this beneficiated salvage fuel which would
 - ..permit continued and extended use of existing stoker-fired steam (power) plants
 - ..provide investment justification for modernization of air pollution control systems.
- incentives to the private sector, (in particular the secondary materials industry), for further commitment to assist in coping with the ever growing solid waste problem.
- the husbanding of our natural resources - fossil fuels - ferrous and non-ferrous raw materials - cellulose fibers and conservation of our land areas for broader utilization.

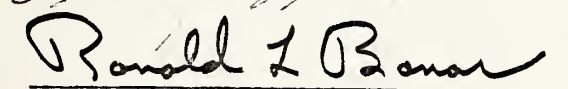
We, of course, would be pleased to have appropriate Fort Wayne officials and engineers review any of the aspects with you whenever convenient.

Your time and consideration is appreciated by the citizens of Fort Wayne and those nationally who will benefit from the innovative technology and systems which will be demonstrated by this undertaking.

Yours truly,

BOARD OF PUBLIC WORKS





CC: E.P.A., Rockville, Maryland
Indiana State Board of Health
Three Rivers Coordinating Council

APPLICATION FOR FEDERAL ASSISTANCE

EPA PROJECT CONTROL NO.

G.A.D. 801568

DATE RECEIVED

FORMER FEDERAL NO.
(If any)

P.E. NUMBER

PART I.

GENERAL INFORMATION

1. APPLICANT

a. NAME

Board of Public Works
City of Fort Wayne, Indiana

b. DEPARTMENT/DIVISION

Board of Public Works

c. CONGRESSIONAL DISTRICT

Indiana 4th

d. ADDRESS (Street or P.O. Box Number, Town, City, State
and Zip Code)City-County Building
One Main Street
Fort Wayne, Indiana 46802

e. COUNTY

Allen

2. PROJECT TITLE Beneficiated Solid Waste Cubettes as Salvage Fuel for Municipal Steam -
Electric Generator (Cubettes as Fuel) C.A.F.

3. CATALOG NUMBER AND TITLE OF EPA PROGRAM(S) TO WHICH THIS APPLICATION IS DIRECTED

66.300 Solid Waste Demonstration and Resource Recovery System Grants

4. TOTAL COST OF PROJECT

\$ 3,526,640

5. TOTAL BUDGET PERIOD COST OF PROJECT

\$ 190,000

6. TOTAL EPA SHARE REQUESTED FOR

BUDGET PERIOD #1

\$ 140,000

7. PROJECT PERIODS - Total

FROM: Sept. 1972 TO: Jan. 1975

8. BUDGET PERIODS - Total

FROM: Sept. 1972 TO: Jan. 1975

9. TYPE OF APPLICANT (Check appropriate box or boxes)

a. GOVERNMENTAL AGENCY

b. NONGOVERNMENTAL

c. OTHER

STATE

INTERSTATE

☒ MUNICIPAL

INTERMUNICIPAL

NONPROFIT ORGANIZATION
OR INSTITUTIONPROFIT-MAKING ORGANIZATION
OR INSTITUTION

INDIVIDUAL

COLLEGE OR UNIVERSITY

10. TYPE OF GRANT

☒ NEWb. ☐ CONTINUATION (Current Grant Number _____)1. PROJECT
LOCATION

a. STATE

Indiana

b. COUNTY

Allen

c. MUNICIPALITY

Fort Wayne

d. CONGRESSIONAL DISTRICT

Indiana 4th

2. PROJECT
AREA

a. STATE

Indiana

b. COUNTY

Allen

c. MUNICIPALITY

Fort Wayne

d. CONGRESSIONAL DISTRICT

Indiana 4th

11. DOES PROJECT REQUIRE CLEARINGHOUSE NOTIFICATION IN ACCORDANCE WITH OFFICE OF MANAGEMENT AND
BUDGET CIRCULAR A-95?

YES

NO

☒12. HAS AN ENVIRONMENTAL ASSESSMENT BEEN MADE FOR THIS PROJECT OR FOR A COMPREHENSIVE PLAN WHICH
INCLUDES THIS PROJECT?☒13. HAS AN ENVIRONMENTAL IMPACT STATEMENT BEEN MADE FOR THIS PROJECT OR FOR A CLASS OF PROJECTS
INCLUDING THIS PROJECT?☒

FEDERAL AGENCY

b. DATE

14. IS THE PROJECT COVERED BY A CURRENT
FEDERALLY APPROVED PLAN?☒

15. APPLICANT CONTACT

a. NAME

Newell Cunningham

b. TITLE

Superintendent of Electrical Generating Station

c. ADDRESS (Street, City, State and Zip Code)

City-County Building, One Main Street, Fort Wayne, Indiana 46802

d. PHONE NO. (Include
Area Code)

(219) 423-7137

OFFICIAL AGENCY TO WHOM CHECKS ARE TO BE MAILED

a. TITLE

Board of Public Works
City of Fort Wayne

b. ADDRESS (Street, City, State and Zip Code)

City-County Building
Fort Wayne, Indiana 46802

16. SUBMISSIONS TO OTHER FEDERAL AGENCIES

None

PART II.

SCHEDULE A - BUDGET

APPLICANT'S NAME

EPA PROJECT CONTROL NO.

Board of Public Works, City of Fort Wayne, Indiana

G.A.D. 801568

SECTION A - BUDGET BY SOURCE

	FUNDING SOURCE	FUNDS REQUIRED	
		BUDGET PERIOD #1	PROJECT PERIOD
EPA SOURCES	Solid Waste Demonstration & Resource Recovery		
	Systems Grants 66.300	\$140,000	\$1,750,000
	TOTAL		
OTHER FEDERAL SOURCES			
	TOTAL		
NON FEDERAL SOURCES	Board of Public Works, City of Fort Wayne, Ind.	50,000	1,776,640
	TOTAL		
	TOTAL BUDGET	\$190,000	\$3,526,640

SECTION B - BUDGET ESTIMATES FOR BALANCE OF THE PROJECT PERIOD

ADDITIONAL SUPPORT TO COMPLETE PROJECTS

FUNDING SOURCE	BUDGET PERIODS		
	FROM <u>May '73</u> TO <u>Jan. '74</u> ^{Period #2}	FROM <u>Jan. '74</u> TO <u>Jan. '75</u> ^{Period #3}	FROM _____ TO _____ ⁽³⁾
EPA SUPPORT	\$ 810,000	\$ 800,000	
OTHER FEDERAL SUPPORT	---	---	
OTHER FUNDING SOURCE	1,695,950	30,690	
TOTALS	\$2,505,950	\$ 830,690	

SECTION C - FORECASTED CASH NEEDS BY QUARTER Budget Period #1

FUNDS SOURCE	FIRST QUARTER	SECOND QUARTER	THIRD QUARTER	FOURTH QUARTER	TOTAL
FEDERAL	\$40,000	\$100,000			\$140,000
NON-FEDERAL	\$25,000	\$ 25,000			\$ 50,000

APPLICANT'S NAME

Board of Public Works, City of Fort Wayne, Indiana

EPA PROJECT CONTROL NO.

G.A.D. 801568

SECTION D - BUDGET BY COST CATEGORY OR PROGRAM ELEMENT

TABLE A. COST CATEGORY	PROJECT PERIOD		BUDGET PERIOD		EPA USE ONLY	
	TOTAL	REQUESTED	TOTAL	REQUESTED	ALLOWABLE BUDGET PERIOD COSTS	APPROVED GRANT AMOUNT
PERSONNEL						
FRINGE BENEFITS						
TRAVEL						
EQUIPMENT						
SUPPLIES						
CONTRACTUAL PERSONAL SERVICES						
CONSTRUCTION						
OTHER						
TOTAL DIRECT COSTS						
INDIRECT COSTS						
TOTALS						

TABLE B. PROGRAM ELEMENT	Total PROJECT PERIOD		BUDGET PERIOD #1		EPA USE ONLY	
	TOTAL	REQUESTED	TOTAL	REQUESTED	ALLOWABLE BUDGET PERIOD COSTS	APPROVED GRANT AMOUNT
Phase IA	25,000	25,000	25,000	25,000		
Phase IB	25,000	25,000	25,000	25,000		
Phase IC	1,445,950	900,000	140,000	90,000		
Phase ID	1,200,000	-0-	---	---		
Phase II	830,690	800,000	---	---		
TOTALS	3,526,640	1,750,000	190,000	140,000		

SECTION E - DETAILED ITEMIZATION OF DIRECT COSTS (See Instructions)

SECTION F - INDIRECT COSTS

INDIRECT COSTS ARE A

☐ PREDETERMINED FIXED RATE☐ PROVISIONAL RATE: _____ % OF _____

BASE

If the indirect cost rate is predetermined fixed, indicate the Federal agency that approved the cost allocation plan or if the indirect cost rate is a proposed provisional rate, indicate any Federal agency that has approved the use of such rate.

NAME OF AGENCY

DATE OF APPROVAL



PART II

SCHEDULE B - BUDGET

(For construction projects and other projects involving land acquisition, land development, or the relocation of individuals and businesses.)

APPLICANT'S NAME
Board of Public Works, City of Fort Wayne, IndianaEPA PROJECT CONTROL NO.
G.A.D. 801568

SECTION A - CALCULATION OF EPA GRANT

COST CLASSIFICATION	PROJECT PERIOD COST	BUDGET PERIOD COST	EPA USE ONLY
			AMOUNT APPROVED FOR BUDGET PERIOD
1. ADMINISTRATIVE EXPENSES			
2. LAND, STRUCTURES, RIGHT-OF-WAY			
3. ARCHITECTURAL, ENGINEERING BASIC FEES			
4. OTHER ARCHITECTURAL/ENGINEERING FEES			
5. CONSTRUCTION AND PROJECT IMPROVEMENT COST	See detailed estimate enclosed with application.		
6. EQUIPMENT			
7. CONTINGENCIES			
8. RELOCATION PAYMENTS			
9. INDIRECT COSTS			
10. TOTALS	TOTALS		

SECTION B - INDIRECT COSTS

DIRECT COSTS ARE A PREDETERMINED FIXED RATE OF _____ % OF _____ BASE	
NAME OF AGENCY THAT APPROVED THE RATE	DATE OF APPROVAL

SECTION C - BUDGET BY FUNDING SOURCE

FUNDING SOURCE	FUNDS REQUIRED		DATE BUDGET PERIOD FUNDS AVAILABLE
	PROJECT PERIOD	BUDGET PERIOD #1	
EPA SOURCES	Solid Waste Demonstration & Resource Recovery Systems Grants 66,300		
	1,750,000	140,000	
	TOTAL		
OTHER FEDERAL SOURCES			
	TOTAL		
STATE FUNDS SUPPLIED BY APPLICANT	STATE AID		
	TOTAL		
	CASH	576,640	50,000
	GENERAL OBLIGATION FUNDS		
	REVENUE BONDS/CERTIFICATES		
OTHER NON- FEDERAL SOURCES	OTHER: National Recycling Corp Contrib.	1,200,000	
	TOTAL		
	TOTAL		
TOTALS		\$3,526,640	\$190,000

PART III

CERTIFICATION AND AGREEMENT

The undersigned representative certifies that the information submitted herewith is true and correct to the best of his knowledge and belief and that he is authorized to sign and submit this application.

The applicant agrees that if a grant is awarded on the basis of this application or any revision or amendment thereof, it will comply with all applicable statutory provisions and with the applicable terms, conditions, and procedures of the Environmental Protection Agency grant regulations (40 CFR Chapter I, Subchapter B) and of the grant agreement.

SIGNATURE OF AUTHORIZED REPRESENTATIVE

TYPED NAME AND TITLE

Jerry D. Boswell, Chairman Board of Public Works

DATE

PHONE NUMBER (Include Area Code)

PROPOSAL VALIDITY DATE

July 15, 1972

(219) 423-7018

October 17, 1972

U.S. GOVERNMENT USE ONLY

AGENCY INTERNAL REFERRAL OFFICE

DATE RECEIVED

DATE REFERRED

REFERRED TO

AGENCY EXTERNAL REFERRAL

DATE RECEIVED

DATE REFERRED

REFERRED TO

ENVIRONMENTAL PROTECTION AGENCY
ASSURANCE OF COMPLIANCE
(TITLE VI, CIVIL RIGHTS ACT OF 1964)

Board of Public Works, City of Fort Wayne (hereinafter called "Assuror")
NAME OF APPLICANT-RECIPIENT Indiana

HEREBY AGREES THAT IT will comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352) and all requirements of the Environmental Protection Agency (hereinafter called "EPA") issued pursuant to that title, to the end that in accordance with Title VI of that Act, no person in the United States shall, on the ground of race, color, or national origin be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the Assuror receives financial assistance from EPA and hereby gives assurance that it will now and hereafter take all necessary measures to effectuate this agreement.

If any real property or structure thereon is provided or improved with the aid of financial assistance extended to the Assuror by EPA, this Assurance obligates the Assuror, or in the case of any transfer of such property, any transferee for the period during which the real property or structure is used for a purpose involving the provisions of similar services or benefits. If any personal property is so provided, this Assurance obligates the Assuror for the period during which it retains ownership or possession of the property. In all other cases, this Assurance obligates the Assuror for the period during which the financial assistance is extended to it by EPA.

THE ASSURANCE is given in consideration of and for the purpose of obtaining any and all Federal grants, loans, contracts, property discounts or other financial assistance extended after the date hereof to the Assuror by EPA including installment payments after such date on account of arrangements for Federal financial assistance which were approved before such date. The Assuror recognizes and agrees that such Federal financial assistance will be extended in reliance on the representations and agreements made in this Assurance and that the United States shall reserve the right to seek judicial enforcement of this Assurance. This Assurance is binding on the Assuror, its successors, transferees, and assignees, and the person or persons whose signature appear below are authorized to sign this Assurance on behalf of the Assuror.

The obligations assumed by the Assuror hereunder are in addition to any obligations which may be imposed on the Assuror by any applicable regulation now outstanding or which may hereafter be adopted by EPA to effectuate any provision or goal of the said Title VI, and no part of this Assurance shall be read so as to in any way detract from or modify any obligation which may be imposed on the Assuror by any such regulation standing alone.

July 13, 1972

DATE

Board of Public Works, City of Fort Wayne,
ASSUROR
Indiana

By


PRESIDENT, CHAIRMAN OF BOARD OR
COMPARABLE AUTHORIZED OFFICIAL

Chairman, Board of Public Works

Board of Works, City-County Building
One Main Street, Fort Wayne, Indiana 46802

ASSUROR'S MAILING ADDRESS

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SECTION - STATE OF INDIANA

GOVERNOR EDGAR D. WHITCOMB

SENATOR VANCE HARTKE

SENATOR BIRCH BAYH

CONGRESSMAN J. EDWARD ROUSH

INDIANA AIR POLLUTION CONTROL BOARD

INDIANA STATE BOARD OF HEALTH

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COALITION FOR THE ENVIRONMENT

IZAAK WALTON LEAGUE OF AMERICA, INC. - Fort Wayne Chapter

IZAAK WALTON LEAGUE OF AMERICA, INC. - Indiana Division

PURDUE UNIVERSITY

THE JOURNAL-GAZETTE - Daily local newspaper

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WHY FORT WAYNE?

There are ALREADY operating in Fort Wayne two substantial systems:

- a publicly owned utility.
- a privately financed salvage industry.

Both represent very substantial investments by the public and industry.

So much Facility already exists that the Environmental Protection Agency has the opportunity to prove concepts of material and energy recovery in a very short time frame and with a relatively modest expenditure of public funds. This expenditure will feed back information directly for the public benefit rather than as support to a particular industrial conglomerate.

To this rare cooperative arrangement of private industry and a publicly owned utility joining hands, is added another very important feature.

There are two individual electric utilities in Fort Wayne, using the same poles for electric distribution. Should there be an extended outage of the boiler plant during the demonstration (no such happening is anticipated) there would be no deprivation of essential services to the public. The private power company has sufficient carrying capacity into the City to handle essential services and the City-owned utility has at a location remote from the boiler plant, a "Black Start" capability peaking gas turbine of sufficient capacity to supply the Water Filtration and Pumping Plant, the Water Pollution Control Plant and other essential services.

National Recycling Corporation has had for some time, markets for their secondary materials and continues to develop additional refined salvage materials to satisfy the emerging markets.

The two Fort Wayne boilers selected to utilize cubettes as fuel are:

- of the same type, design and capacity.
- operated by the same experienced utility class personnel.
- subject to the same load demands and conditions.

Therefore, a great variety of feed combinations can be rigorously evaluated simultaneously.

The above key considerations emphasize that here and now there exists, with the Fort Wayne Program, an ideal opportunity for controlled evaluation of a viable waste conversion and resource recovery program, having broad national implications for the general welfare.

THE FORT WAYNE PROGRAM

The Fort Wayne Program is a multi-faceted approach for practical solutions to the growing solid waste disposal burden, to the increasing needs for fuel and electric energy, as well as the desire for environmental enhancement and resources conservation.

The Fort Wayne Program is a cooperative effort between the City of Fort Wayne, Department of Public Works, Department of Utilities and the local materials salvage industry, principally the NATIONAL RECYCLING CORPORATION.

The Fort Wayne Program would modify, adapt and supplement the plants currently in operation

- to process the residual combustible fraction from the "materials salvage" operation into a controlled quality salvage fuel cubette.
- to receive, store, feed, monitor and burn the "cubetted salvage fuel" as a supplement to coal in the existing stoker fired steam generators of the Municipal Electric Station.

The attached document, prepared by ROY F. WESTON, INC. (Environmental Scientists and Engineers) illustrates and describes the background, development, facilities, program and assessment of the entire approach.

With the assistance of the Federal E.P.A., a rigorous one-year evaluation program is contemplated at the waste processing and municipal electric plants.

- 1) Determine the technical and economic feasibility of segregating that portion of the Community's solid wastes that cannot currently be recycled; and establish the nature of preparation necessary for its utilization as a "predictable" fuel for steam generation.

Periodically characterize the raw waste delivered to and concomitant product streams from the processing plant.

- 2) Demonstrate that the useful economic life of existing stoker fired boilers can be extended by using cubetted solid wastes as a fuel source; determine the extent to which prepared salvage fuel cubettes may be used in existing facilities--in composite fuel ratios up to 100% refuse fuel, i.e., 0%, 25%, 50%, 75%, 100%.

Prior to the three (3) week test data gathering and performance evaluation period for EACH composite fuel ratio approximately three (3) weeks of operation is anticipated to establish discrete procedures, equipment adjustment and calibration, so as to reasonably assure the desired steady state test conditions.

- 3) Determine during each test/evaluation operating day a proximate fuel analysis including sulfur and chloride content of a representative coal and cubette sample. Bottom ash and fly-ash analyses would also be made each day to determine the carbon, chloride and sulfur content, and the total residue weight.
- 4) Determine magnitude and nature of deposits on boiler tubes and metal wastage potential by monitoring the condition of at least six (6) new and old tubes, to be strategically located in the steam generator. This investigation aspect will be coordinated with the on-going research program on metal wastage EPA-OR&M, Contact No. EP00325-03.
- 5) Determine the effect on stack particulate and gaseous emissions when using the programmed ratios of composite coal/refuse fuel cubettes and relate to that when burning coal only.
- 6) Determine the KW production cost saving (if any) when using combination coal and solid waste fuels.

When considering the total economics of the project, the savings accrued due to lesser landfill operations, subsequent extension in existing landfill life, and extended utilization of existing generation facilities would be taken into account, the parameters to be used will be established in conjunction with EPA-OSWMP.

- 7) Determine the "availability" of the system by maintaining a rigorous log on all outages with detailed accounts on those (if any) which can be attributed to the salvage fuel utilization aspect.
- 8) Project the size and design from both an operational and economic standpoint for an optimum processing facility and salvage fuel cubette fired steam generating units.
- 9) Project the experiences gained from this program for possible applications in other communities.

A summary of the potential benefits to be realized from this FORT WAYNE PROGRAM are:

- recovery of those "material resource" elements in waste having commercial values which currently can be realistically obtained, with provision for future extension.
- modification, within practical limits, of the remaining fraction of the wastes, to permit utilization as a locally derived, low sulfur fuel source affording:

- . . .controlled physical size and density
 - . . .controlled moisture content
 - . . .controlled inerts content
 - . . .faculty for simple handling, prolonged storage and ease of retrieval.
- rejuvenation of existing steam generating plants equipped with coal burning stokers (with minor modifications to accomodate this new fuel source) to prolong the useful life (and investment) of these older facilities by improving the cost of steam production.
- possible installation of new optimized steam generators replacing several modest-sized boiler units, which ordinarily do not hold their "youth" as well as turbine-generators. Modern, larger steam generators to serve existing turbine plants might also provide additional economies in maintenance and manpower requirements.
- these types of "lump" fuel firing systems, having the characteristic of very low particular entrainment, would expedite improved stack emission quality by utilizing "cubetted" fuels emanating from the materials resource recovery facility. These beneficiated salvage fuels would have little (if any) of the burdensome constituents such as metals, glass, ceramics, dirt, etc., normally encountered in as-discarded municipal wastes.
- the economic value of "cubetted", "sorted" refuse can provide support or incentive (to the secondary materials industry) to invest and operate facilities for this aspect of resource recovery or to broker the by-product from publicly-operated facilities.
- conservation of fossil fuel reserves.
- significant extension of the life of the land areas used as a waste depository, because only those materials which have no significant material or thermal recovery value would be buried in the land.
- broadening the alternatives for future use of the receiving land areas because the materials to be buried would be essentially inert.

BENEFICIATED, CONTROLLED QUALITY, SALVAGE FUEL CUBETTES SUITABLY PREPARED
 COULD BE AN ECONOMICALLY ATTRACTIVE, LOCALLY DERIVED, LOW SULFUR, LOW
 CONTAMINENT, SUPPLEMENTARY FUEL SOURCE AND SHOULD ASSIST IN A PROGRAM
 TO IMPROVE THE QUALITY OF STACK GAS EMISSION.

SOLID WASTE CUBETTES FUEL UTILIZATIONContemplated Evaluation Program At Fort Wayne Steam Generating PlantCubette Salvage Fuel Utilization

Boiler Rating (each unit) 125,000 pounds steam per hour at 84% Efficiency

- Assume Operation with Composite Fuel Operation at 100,000 pounds steam per hour
- Assume Efficiency with Composite Fuel Operation at 75%
- Assume Cubettes at 6,000 BTU per pound as fired

Input Requirement = 133,000,000 BTU per hour

Ratio of Cubettes to Coal to be on a BTU Input Basis

Coal To Cubette BTU Input Ratio 3:1 - 25% Cubette

Therefore BTU Input from Cubettes

$$133,000,000 \text{ BTU Required} \times 25\% = 33,235,000 \text{ BTU}$$

$$\frac{\text{Cubette BTU Input}}{\text{Cubette BTU per pound}} = \frac{33,235,000}{6,000} = 5,539 \text{ pounds Cubettes per hour}$$

$$5,539 \text{ pounds Cubettes} = 2.76 \text{ tons Cubettes per hour per boiler}$$

$$\begin{aligned} \text{One boiler operation for 24 hours} &= 2.76 \text{ tons Cubettes per hour} \times 24 \text{ hours} \\ &= 66 \text{ tons Cubettes per day} \end{aligned}$$

$$\begin{aligned} \text{Two boiler operation} &= 132 \text{ tons Cubettes per day} \\ &\text{(equivalent to approximately 220 tons *RMW)} \end{aligned}$$

Coal To Cubette Ratio 2:1 - 33% Cubette

$$\begin{aligned} \text{Input Required} &= 133,000,000 \text{ BTU per hour per boiler} \\ \text{Cubette Input Required} &= 44,333,000 \text{ BTU per hour per boiler} \\ \text{Cubettes Required} &= 7,388 \text{ pounds per hour per boiler} \\ &= 3.694 (3.7) \text{ tons per hour per boiler} \end{aligned}$$

$$\begin{aligned} \text{One boiler operation for 24 hours} \\ \text{Cubette tons per day} &= 3.7 \text{ tons Cubettes per hour} \times 24 \text{ hours} \\ &= 88.8 \text{ tons Cubettes per day} \end{aligned}$$

$$\begin{aligned} \text{Two boiler operation} &= 178 \text{ tons Cubettes per day} \\ &\text{(equivalent to approximately 300 tons *RMW)} \end{aligned}$$

*Raw (Mixed) Municipal Waste

Coal To Cubette Ratio 1:1 - 50% Cubette

Input Required = 133,000,000 BTU per hour per boiler

Cubette Input Required = 66,500,000 BTU per hour per boiler

Cubettes Required = $\frac{66,500,000}{6,000}$ = 11,083 pounds per hour per boilerCubette tons per hour = $\frac{11,083}{2,000}$ = 5.5 tons per hour

One boiler operation for 24 hours

Cubette tons per day = 5.5 x 24 = 132 tons per day

Two boiler operation = 264 tons per day

(equivalent to 440 tons *RMW)

Coal To Cubette Ratio 1:3 - 75% Cubette

Input Required = 133,000,000 BTU per hour per boiler

Cubette Input Required = 99,750,000 BTU per hour per boiler

Cubettes Required = 16.625 pounds per hour per boiler
= 8.3 tons per hour

One boiler operation for 24 hours

Cubette tons per day = 8.3 x 24 = 199.2 tons per day

Two boiler operation = 398.4 tons per day

(equivalent to approximately 665 tons *RMW)

Coal To Cubette Ratio 0:1 - 100% Cubette

Input Required = 133,000,000 BTU per hour per boiler

Cubette Input Required = 22,166 pounds Cubettes per hour per boiler

Cubettes Required = 11 tons per hour per boiler

One boiler operation for 24 hours

Cubette tons per day = 11 x 24 hours = 264 tons Cubettes per day

Two boiler operation = 528 tons Cubettes per day

(equivalent to 839 tons *RMW)

*Raw (Mixed) Municipal Waste



RESOURCE RECOVERY DEMONSTRATION GRANTS - REQUIREMENTS AND CRITERIA

The following sections delineate requirements for applicants and criteria against which all preproposals and proposals will be judged. The legal requirements are defined by Section 203(b) of the Solid Waste Disposal Act as amended. The technical, product, and market requirements reflect the objectives defined by the program plans. Criteria are qualitative yardsticks by which the superior proposals will be selected.

I. Requirements for Application

- A. Legal Requirements (refer also to the Federal Register, Vol.36, No. 229, Part II, Saturday, November 27, 1971, whose requirements must also be met).

Fort Wayne
Submission
Section

Fort Wayne Accomodation of EPA - Requirements and Criteria

1. Requirements for Application

A. Legal Requirements -

1. Consult Fort Wayne Application Forms

- | | |
|---|---|
| A | 2. a. "The Fort Wayne Program" |
| A | b. same |
| A | c. same |
| K | d. Agreement - National Recycling Corporation with Fort Wayne |
| A | e. "The Fort Wayne Program" |
| E | "Preliminary Economic Summary" |

3. "Cubettes as Fuel Project Time Phase Diagram" Agreement National Recycling Corporation with City of Fort Wayne

- | | |
|---|--|
| S | B. 1. City of Fort Wayne, Indiana Preliminary
Evaluation of Community Solid Wastes Utilized
As Salvage Fuel Cubettes For Municipal
Electric Generation. Roy F. Weston.
August 30, 1971. Page 6 |
|---|--|

- | | |
|---|---|
| K | 2. National Recycling Corporation letter to
J. D. Boswell, Ph.D., City of Fort Wayne
July 10, 1972 - "Current Capability" |
|---|---|

CITY OF FORT WAYNE, INDIANA

Fort Wayne
Submission
Section

Fort Wayne Accomodation of EPA - Requirements and Criteria
(continued)

S
K

3. Exhibit K - "Typical Materials Flow Diagram" in Roy F. Weston Preliminary Report. NRC letter to J. D. Boswell, Ph.D., City of Fort Wayne - July 10, 1972 - "Current Capability"

O

4. Regional Planning Agency - Three Rivers Coordinating Council letter dated July 10, 1972 from Elias G. Samaan, Executive Director

C. Product and Market Requirements

M

1. Not applicable - No agricultural products
2. These letters of intent are actual letters restating their intention to purchase the refined product from National Recycling Corporation

Levin and Sons, Inc. dated May 3, 1972
Superior Companies dated May 1, 1972

3. Does not apply

D. Management Requirements

1. Complete documented detailed information will be furnished upon request. Management operating and consulting personnel involved in this program each have upwards of 15 years depth of experience in their area of involvement.
2. This is understood.

C

II. A. Environmental Impact - See Environmental Assessment Summary

B. Potential for national applicability

J

1. See Roy F. Weston Exhibit in July 15, 1972 submittal, "Boiler Plants With Stoker Equipment Suitable For Cubette Salvage Refuse Fuel Firing".

J

Lists compiled for: Municipal Steam - Electric Stations - Government Boiler Plants

2. Literature search has not uncovered any commercial facility duplicating the concepts presented in this application.

C. Participation and Support

1. Not applicable
2.
 - a. See agreement - National Recycling Corporation with Fort Wayne.
 - b. See "Preliminary Economic Summary"
 - c. See "Preliminary Economic Summary"
3. Public Support
See Environmental Assessment Summary
See Exhibits:
 - Letter dated October 20, 1971 - "Three Rivers Coordinating Council"
 - Letter dated July 10, 1972 - "Three Rivers Coordinating Council"
 - Letter dated May 1, 1972 - Sheldon F. Gottlieb, Ph. Purdue University
 - Letter dated May 22, 1972 - Izaak Walton League of America, Inc.
 - Letter dated May 23, 1972 - Izaak Walton League of America, Inc.
 - Letter dated July 12, 1972 - George Tetherly, City Editor, The Journal-Gazette
 - Letter dated July 12, 1972 - Beckman, Yoder and Sea

D. Technical Merits

- Technical merits are summarized in the section entitled, "The Fort Wayne Program" and the feasibility study sketches provided in the exhibits.

E. Economics

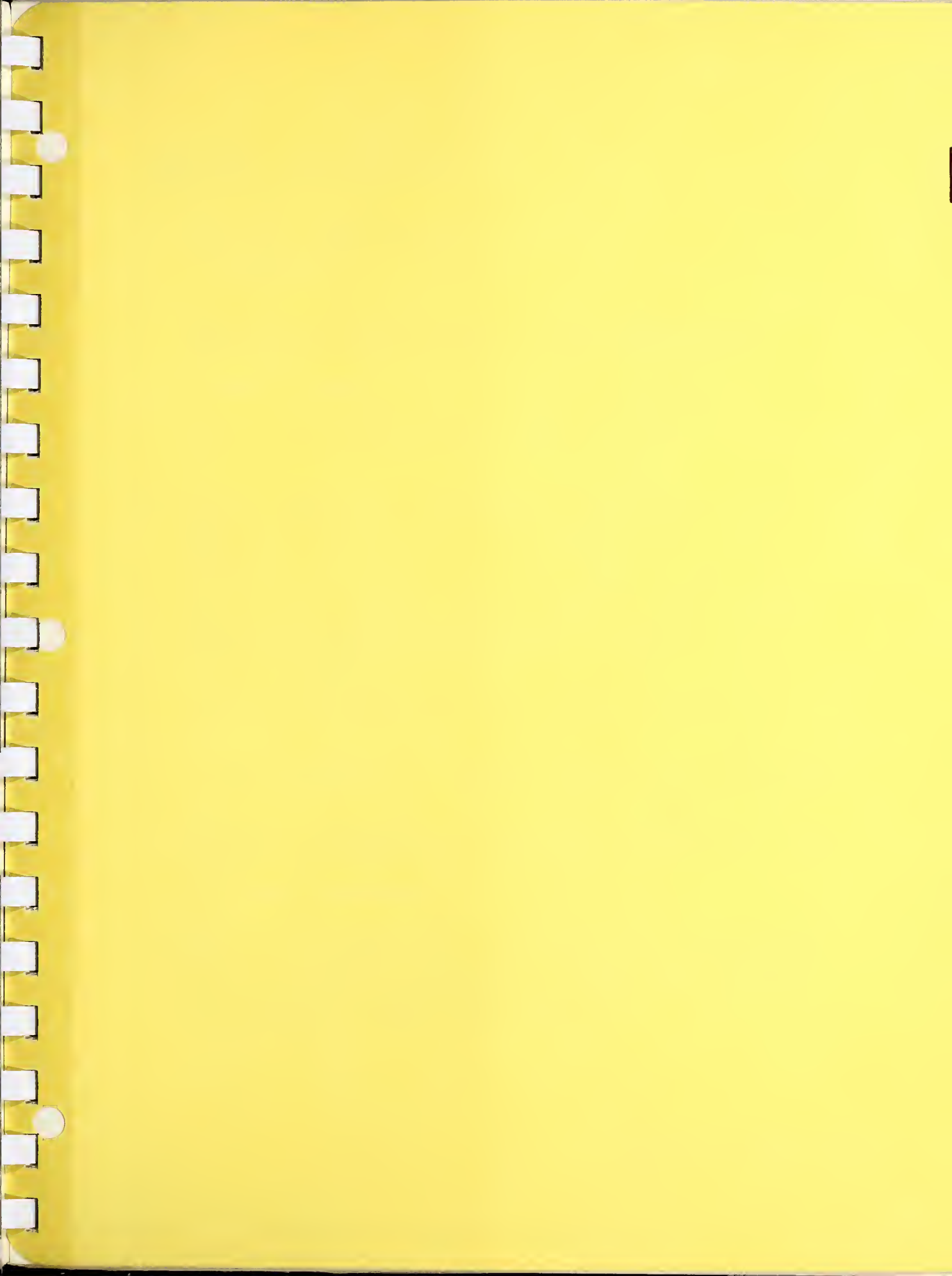
1. Full documentation of pilot runs not available.
See Roy F. Weston preliminary report and Edward Law's discussion of the selection of the John Deere Cuber.
2.
 - a. See "Phase I-C Estimate for Equipment"
 - a. See "Preliminary Economic Summary"
 - b. See "Preliminary Economic Summary"
 - See "Phase II Estimate for Performance Evaluation (one year)"
 - c. Resource Value
Refer to proposed program summary within the economic feasibility review section.

Fort Wayne
Submission
Section

Fort Wayne Accomodation of EPA - Requirements and Criteria
(continued)

- | | |
|---|---|
| E | d. Refer to proposed program summary within the economic feasibility review section. |
| E | e. See Graphic Exhibit, "Solid Waste Disposal System - Alternatives Considered" |
| E | f. See 2-C above. |
| E | 3. Operation and maintenance costs. See 2-C above, specifically, preliminary economic review. |
| F | Market analysis not needed as market for salvageable main stream from National Recycling is already established. |
| G | Complete endorsement by the Environmental Control Board of The Three Rivers Coordinating Council is included in the exhibit of letters. |

CITY OF FORT WAYNE, INDIANA



ENVIRONMENTAL ASSESSMENT SUMMARY

A. Board of Public Works
City of Fort Wayne, Indiana
City-County Building
One Main Street
Fort Wayne, Indiana 46802

"Cubettes As Fuel (C.A.F.) Beneficiated Solid Waste Cubettes
As Salvage Fuel For Municipal Steam-Electric Generation"

Location - Indiana, (Allen County), Fort Wayne

Project Contact - Newell F. Cunningham
219/423-7137

- Bla. The Fort Wayne Program is a multi-faceted approach for practical solutions to the growing solid waste disposal burden, to the increasing needs for fuel and electric energy, as well as the desire for environmental enhancement and resources conservation.

The Fort Wayne Program is a cooperative effort between the City of Fort Wayne, Department of Public Works, Department of Utilities and the local materials salvage industry, principally the NATIONAL RECYCLING CORPORATION.

The Fort Wayne Program would modify, adapt and supplement the plants currently in operation

--to process the residual combustible fraction from the "materials salvage" operation into a controlled quality salvage fuel cubette.

--to receive, store, feed, monitor and burn the "cubetted salvage fuel" as a supplement to coal in the existing stoker fired steam generators of the Municipal Electric Station.

THE INVESTMENT AND PHYSICAL FACILITIES ALREADY EXIST.

- Blb. National Recycling has expanded their waste processing plant which has now been in operation more than 1½ years. The investment to date is in excess of \$1,200,000. National Recycling Corporation has permitted the City of Fort Wayne to credit this investment as a portion of the City's share of the grant.

CITY OF FORT WAYNE, INDIANA

ENVIRONMENTAL ASSESSMENT SUMMARY CONTINUED:

- B1c. The Fort Wayne Municipal Electric Generating Plant is operational; represents a very substantial investment; is in good operating condition with a well trained operating force. While not adjacent the two facilities are of close proximity to permit economical transport of the salvage fuel cubettes.

The power plant site permits maximum utilization of available cooling water from two rivers dammed for flood control and hydro generation. The configuration permits rapid depth cooling or recovery of original temperature through recirculation with a minimum of evaporation.

It is proposed to install boiler plant stack emission control equipment in a configuration which will provide maximum data as to the effectiveness of each component or combination of components.

The fuel handling system will be modified to permit a wide ratio range of the two fuels (coal/cubettes) with metering feed scales to accurately control the composite fuel ratios for desired evaluating data.

The National Recycling Plant is designed with maximum flexibility in processing/recovering a wide diversity of recycled products.

There is an approved sanitary landfill adjoining the NRC Plant where it is planned to fill presently unrecyclable material and contingency alternate disposal of waste during turn-around.

- B2. Early pilot runs of the cubettes as fuel in the power plant demonstrated that the cubettes mixed with coal enhanced the burning characteristics of the fuel bed, thereby affording more complete combustion.

The cubetting of the residual portion of cellulose fibers uneconomic for materials reuse will conserve significant areas required for landfill, while conserving fossil fuel reserves.

The present use of water for cooling at the City Power Plant has minimum impact upon the three rivers affected. Laboratory analysis performed for the Army Corps of Engineers, indicated no deleterious effects. Turbidity of the river water was improved and the lifting of the water from river to pond and discharging back through a second river provides the only circulation, relieving river stagnation which would otherwise be present in dry summer months, and provides needed oxygen entrainment for the improvement of fish life support.

ENVIRONMENTAL ASSESSMENT SUMMARY CONTINUED:

B4.	<u>ECONOMIC ALTERNATIVE EVALUATION SUMMARY</u>	Present Cost	Projected 1977
		<u>Per Ton</u>	<u>Cost Per Ton</u>
	Proposed Program - City National Recycling Corp. (Satisfies present and near future economic and technical needs.)	\$1.29(profit)	
	National Recycling Corp. Present System (Interim Solution)	\$2.10	\$3.50
	City - National Serv-All Present Contract (Interim Solution)	\$4.00	\$6.00
	Incineration (Not Economic)	\$8 - \$12	\$12 - \$20
	Experimental Systems Kiln Pyrolysis Slagging Pyrolysis (Not Appropriate)	\$8 - \$14	
B5.	Long term benefit; extension and conservation of both irreplaceable fossil fuels, materials resources and suitable landfill sites. The future possible uses of the landfill are broadened by limiting deposition to only essentially inert materials assuring land stability.		
B6.	No irreversible or irretrievable commitment of resources in the implementation of this project are known to present technology.		
B7.	There have been no objections filed or voiced to this project. It has unqualified endorsement of the local, county, regional and state community.		
B8.	1. Perry E. Miller, Assistant Commissioner for Environmental Health, <u>Indiana Air Pollution Control Board</u> 2. A.C. Offutt, M.D., State Health Commissioner, <u>Indiana State Board of Health</u>		

ENVIRONMENTAL ASSESSMENT SUMMARY CONTINUED:

B4.

ECONOMIC ALTERNATIVE EVALUATION SUMMARY

	<u>Present Cost</u> <u>Per Ton</u>	<u>Projected 1977</u> <u>Cost Per Ton</u>
Proposed Program - City National Recycling Corp. (Satisfies present and near future economic and technical needs.)	\$1.29(profit)	
National Recycling Corp. . Present System (Interim Solution)	\$2.10	\$3.50
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Incineration (Not Economic)	\$8 - \$12	\$12 - \$20
Experimental Systems Kiln Pyrolysis Slagging Pyrolysis (Not Appropriate)	\$8 - \$14	

- B5. Long term benefit; extension and conservation of both irreplaceable fossil fuels, materials resources and suitable landfill sites.
- The future possible uses of the landfill are broadened by limiting deposition to only essentially inert materials assuring land stability.
- B6. No irreversible or irretrievable commitment of resources in the implementation of this project are known to present technology.
- B7. There have been no objections filed or voiced to this project. It has unqualified endorsement of the local, county, regional and state community.
- B8. 1. Perry E. Miller, Assistant Commissioner for Environmental Health,
Indiana Air Pollution Control Board
2. A.C. Offutt, M.D., State Health Commissioner, Indiana State Board of Health

ENVIRONMENTAL ASSESSMENT SUMMARY (CONTINUED):

3. Robert W. Heider, Indiana Board of Health, Division of Sanitary Engineering Chief
 4. Malven L. Olsen, Indiana State Board of Health, Division of Air Pollution Control
 5. Gerald T. Cravey, Indiana State Board of Health, Division of Sanitary Engineering (Solid Waste)
 6. William F. Kehr, Environmental Protection Agency, H.E.W., Chicago
 7. Dr. Maurice Felger, Ph.D., Three Rivers Coordinating Council (regional agency) Environmental Control Board
 8. Sheldon F. Gottlieb, Ph.D., Professor, Biological Sciences, Purdue University
 9. Roy F. Weston, Inc., Environmental Scientists & Engineers
 10. J. Edward Roush, 4th District Congressman, Indiana
 11. Birch Bayh, U. S. Senator, Indiana
 12. Vance Hartke, U. S. Senator, Indiana
 13. S. Don Potter, Executive Secretary, Michigan Municipal Electric Association
 14. Irving Huffman, President, The Indiana Municipal Electric Association
 15. George Crosby, III, President, Ohio Municipal Electric Association
- B9. There will be no significant adverse environmental effects from the implementation of this program. There will be improvement in the areas directly affected.

Solid Waste - utilization rather than destruction or burial.

Radiation - No radioactive waste encountered in this program.

ENVIRONMENTAL ASSESSMENT SUMMARY CONTINUED:

Pesticides - No pesticides encountered in the municipal solid waste.

Water - The Fort Wayne "C.A.F." program is a dry process requiring no water and discharges no waste water. There are no pesticides or combustibles deposited to contaminate diminishing landfill areas.

Land Use - Landfill area use will be extended because of the volume and weight reduction of solid waste to an inert substance and there are no irreversible commitments of land.

Noise - There will be no change in the ambient noise level brought about by the implementation of this program.



TECHNICAL FEASIBILITY REVIEW

The following narrative will describe the exhibits illustrating the feasibility and logistics of the Fort Wayne Program - CUBETTES AS FUEL. This discussion will supplement the Roy F. Weston, Inc. evaluation report of 30 August, 1971, included in this submission.

1. National Recycling Corporation - Schematic Layout of Facilities

This exhibit illustrates the scope of the existing facilities and does indicate, simply, the various processes. The proposed program envisions the location of three additional Cubette forming machines, each with surge-feed bins at locations marked as 31, 32. These cubers would discharge onto a common conveyor. The overhead cubette conveyor will be arranged to load, separately or simultaneously, three selfcompacting-unloading 75 cubic yard transfer trailers. A shed or weathertight covers will be provided to avoid snow or rain from falling on the cubette streams anywhere in the system. A single tractor will be used for maneuvering and hauling to the Municipal Light Plant which is approximately five miles away. The anticipated turn around time will be approximately one hour.

2. Fort Wayne Municipal Light Plant

- * Cubette Receiving and Unloading Schematic
- * Cubette Flow Diagram
- * In Plant Cubette Handling Schematic

These exhibits illustrate:

- the anticipated Cubette traffic route entering the electric station property
- the Cubette Receiving and Storage Bunker
- the configuration of the Cubette Bunker unloading pan conveyors discharging onto the special compound Serpentix conveyor delivering the Cubettes into the Cubette Surge-Feed Control Bunker located over the firing aisle within the steam plant
- the Cubette furnace feed conveyors from the Surge Bunker to the combination coal/Cubette feed-weight scales (Item F)

The south wall of the coal storage yard is shown moved some 15' to the north to provide the space required for the Cubette Receiving-Storage Bunker and conveyors. Ample space will be provided for access, inspection, maintenance, etc. The bunker is located at an elevation which will permit the discharge end of the trailer body to protrude over the Bunker receiving apron.

This arrangement of Cubette receipt-storage-handling will not interfere in any way with the normal coal handling-feeding system; will provide maximum flexibility in controlling the flow rate of each fuel for separate or combined firing. A shed or weathertight covers will be provided to avoid snow or rain from falling on the Cubette streams anywhere in the system.

TECHNICAL FEASIBILITY REVIEW (continued)3. Fort Wayne Municipal Light Plant

- * Preliminary APC - Study A
- * Preliminary APC - Study B
- * Preliminary APC - Study C
- * Preliminary APC - Study D

These exhibits illustrate the various possibilities deemed practical for applying more effective air pollution control of stack discharge.

This type of fuel burning in conjunction with these older boilers provides very low particulate entrainment. These units were designed to permit operation (without encumbering devices) within ASME stack emission guidelines which has been adopted and used by most communities for some forty years.

Study A: This is the simplest, effective and least cost arrangement illustrated. A high efficiency multi-clone collector selected for a pressure drop of 3" wg can be installed, replacing the existing dust arrestor. A new larger induced draft fan and drive would be required. Flue gas sampling in the stack would be required for determination of emission characteristics. It is anticipated that this scope of emission control equipment should result in operation close to or even within the December 23, 1971, EPA criteria promulgated for new installations.

So as to provide the EPA and all boiler plant operations of like size and type, with as much information as possible regarding emission characteristics and control device effectiveness, Study B, C and D were made and the following program of equipment and evaluation is recommended.

Study B, Study C: This Tandem arrangement of two high efficiency multi-clone collectors has proved to be quite effective in further arresting the smaller micron dust particles. Both arrangements illustrated are practical and would provide the desired opportunity to conduct a gas sampling and analysis program which would provide meaningful data for design applications elsewhere. Permanent access facilities for gas sampling have been included. Of the two arrangements shown, Study C is preferred since the gas polishing collector dust hoppers can be located within the building, avoiding dew point condensation potential.

Obviously, a new induced draft fan and stack would be required.

Study D: This illustrates the application of an electrostatic precipitator at significantly greater cost than the Tandem mechanical collector arrangement. It, too, will require a new induced draft fan and stack. The arrangement shown will permit determination of gas quality as if no additional gas cleaning equipment had been installed as well as with the control device.

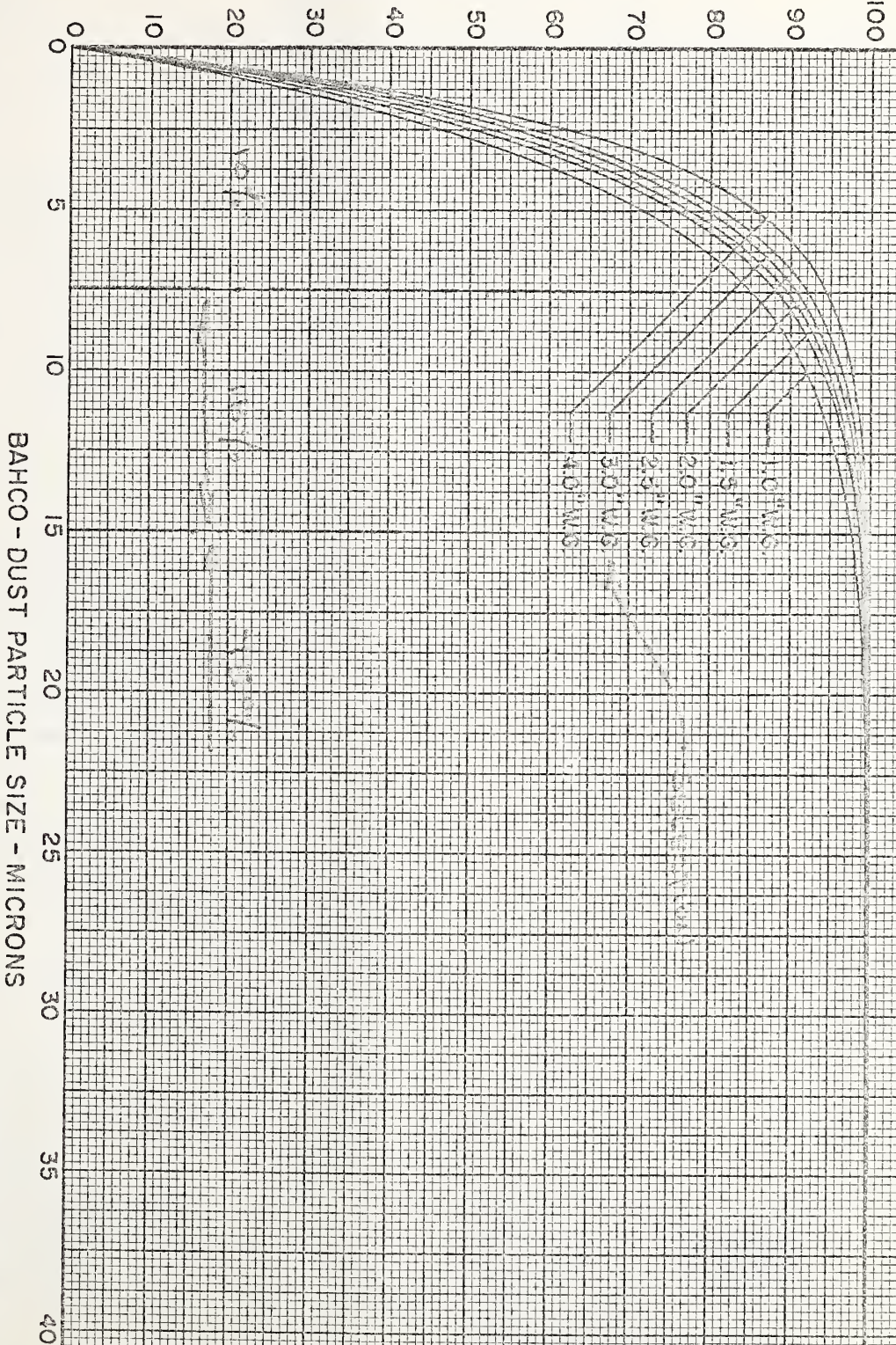
TECHNICAL FEASIBILITY REVIEW (continued)

Gas sampling and analysis is proposed at different load points, with programmed ratios of composite fuels in addition to 100% coal and 100% Cubette.

To provide a truly comprehensive program which will yield data on the entire spectrum of dry-control possibilities, it is recommended that the Tandem mechanical control equipment arrangement similar to Study C be installed on one Steam Generating Unit, and the electrostatic precipitator arrangement similar to Study D be installed on the other Steam Generating Unit.

This will then provide characterization data at four points of prime need to the regulatory agencies, plant operators, equipment manufactures and design engineers. This will be especially valuable to all those seeking guidance in attempting to apply suitable equipment to their existing boilers.

GUARANTEED EFFICIENCY PERCENT



BAHCO - DUST PARTICLE SIZE - MICRONS

CONDITIONS OF CURVE

DUST SPECIFIC GRAVITY - 2.5
DUST CONCENTRATION - 2 TO 5 GR./CU. FT.
GAS TEMPERATURE - 70-800 °F

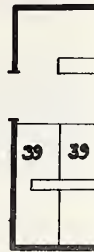
AIR CORRECTION
DIVISION

MICRON EFFICIENCY CURVES
TUBULAR DUST COLLECTOR
DESIGN 6UP

NOTE - THESE DATA ARE CONFIDENTIAL AND THE PROPERTY OF UNIVERSAL OIL PRODUCTS COMPANY AND SHALL NOT BE DISCLOSED OR REPRODUCED IN ANY MANNER OR USED FOR ANY PURPOSE WHATSOEVER EXCEPT BY WRITTEN PERMISSION AS PROVIDED IN A SIGNED AGREEMENT WITH UNIVERSAL OIL PRODUCTS COMPANY RELATING TO SUCH DATA.

COMPUTED BY *MC* DATE *1-9-67* APPROVED BY *ED* DATE *1-9-67* MKTG. *QZ* DATE *1-10-67*

- 1 - SCALE HOUSE
- 2 - TRUCK SCALE 12' X 60'
- 3 - PLANT OFFICE
- 4 - MISCELLANEOUS OFFICES
- 5 - WASTE INLET RAMP
- 6 - WASTE UNLOADING - FEEDING AREA
- 7 - RAW METAL INLET DOCK
- 8 - RAW METAL INLET RAMP
- 9 - RAW METAL STORAGE BINS
- 10 - RAW WASTE APRON CONVEYOR
- 11 - RAW CORRUGATED SLAVAGE CONVEYOR
- 12 - RAW CORRUGATED SHREDDER
- 13 - PNEUMATIC CONVEYOR TO SPECIAL PRODUCT BALER
- 14 - SPECIAL PRODUCT BALER
- 15 - APRON CONVEYOR TO MAIN SHREDDER
- 16 - OPTIONAL BY-PASS COMPACTION STATION
- 17 - CONVEYOR FEED HOPPER
- 18 - MAIN ALL-PURPOSE SHREDDER
- 19 - OPERATOR CONTROL ROOM
- 20 - LOW-DENSITY WASTE PNEUMATIC PICK-UP CONVEYOR
- 21 - MAGNETIC SEPARATOR AND CONVEYOR
- 22 - MAIN (BELT) SHREDDED MATERIAL CONVEYOR
- 23 - SCREENER - ASPIRATOR - CLASSIFIER SYSTEM
- 24 - PNEUMATIC CONVEYOR TO FINAL FIBRE CLEANING SYSTEM
- 25 - FINAL FIBRE CLEANING SYSTEM
- 26 - PNEUMATIC CONVEYOR TO GENERAL PURPOSE BALER
- 27 - GENERAL PURPOSE BALER
- 28 - RESIDUE FROM FINAL FIBRE CLEANING
- 29 - PNEUMATIC FIBRE RESIDUE PICK-UP SYSTEM
- 30 - RESIDUAL STORAGE - FEED TO G BETTER
- 31 - CUBER WITH CONVEYOR TO TRANSFER TRAILER
- 32 - TRANSFER TRAILER
- 33 - STORAGE - TRANSPORT CONTAINERS
- 34 - DUAL STREAM CONVEYOR TO CUBER AND/OR DISPOSAL
- 35 - CERAMIC / GLASS SEPARATION
- 36 - OPTIONAL BY-PASS COMPACTION STATION
- 37 - SECOND-STAGE METALLIC REDUCTION-DISTRIBUTION SYSTEM
- 38 - METALLIC CONVEYOR SYSTEM
- 39 - METALLIC STORAGE BINS
- 40 - METALLIC SEPARATION - CLASSIFICATION SYSTEM
- 41 - RESIDUE FROM METALLIC SYSTEM
- 42 - RECYCLED PRODUCT STORAGE AREA
- 43 - PRODUCT SCALE
- 44 - SHIPPING DOCKS



OUT
SOURCE
TY

371

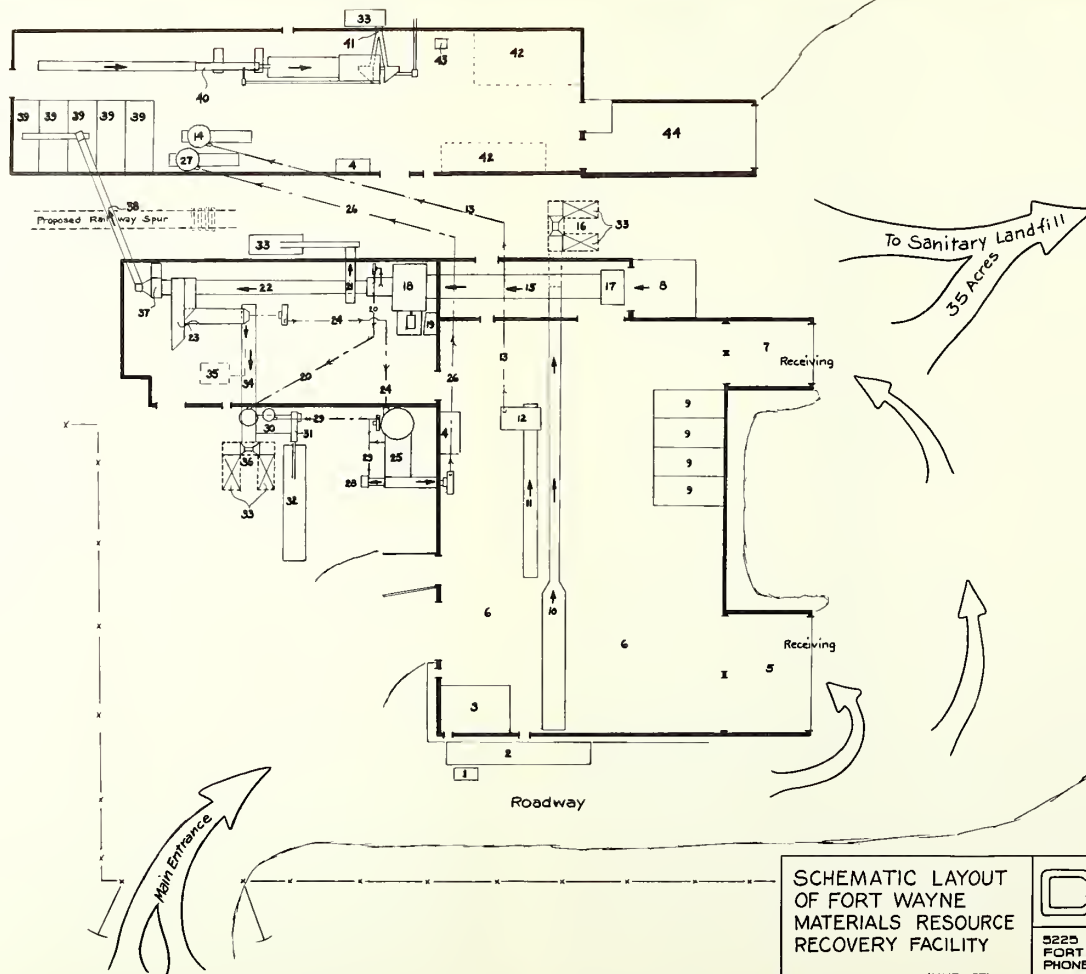


**NATIONAL
RECYCLING
CORPORATION**

5225 OLD MAUMEE ROAD
FORT WAYNE, INDIANA 46803
PHONE (219) 749-9548



- 1 - SCALE HOUSE
- 2 - TRUCK SCALE 12' X 60'
- 3 - PLANT OFFICE
- 4 - MISCELLANEOUS OFFICES
- 5 - WASTE INLET RAMP
- 6 - WASTE UNLOADING - FEEDING AREA
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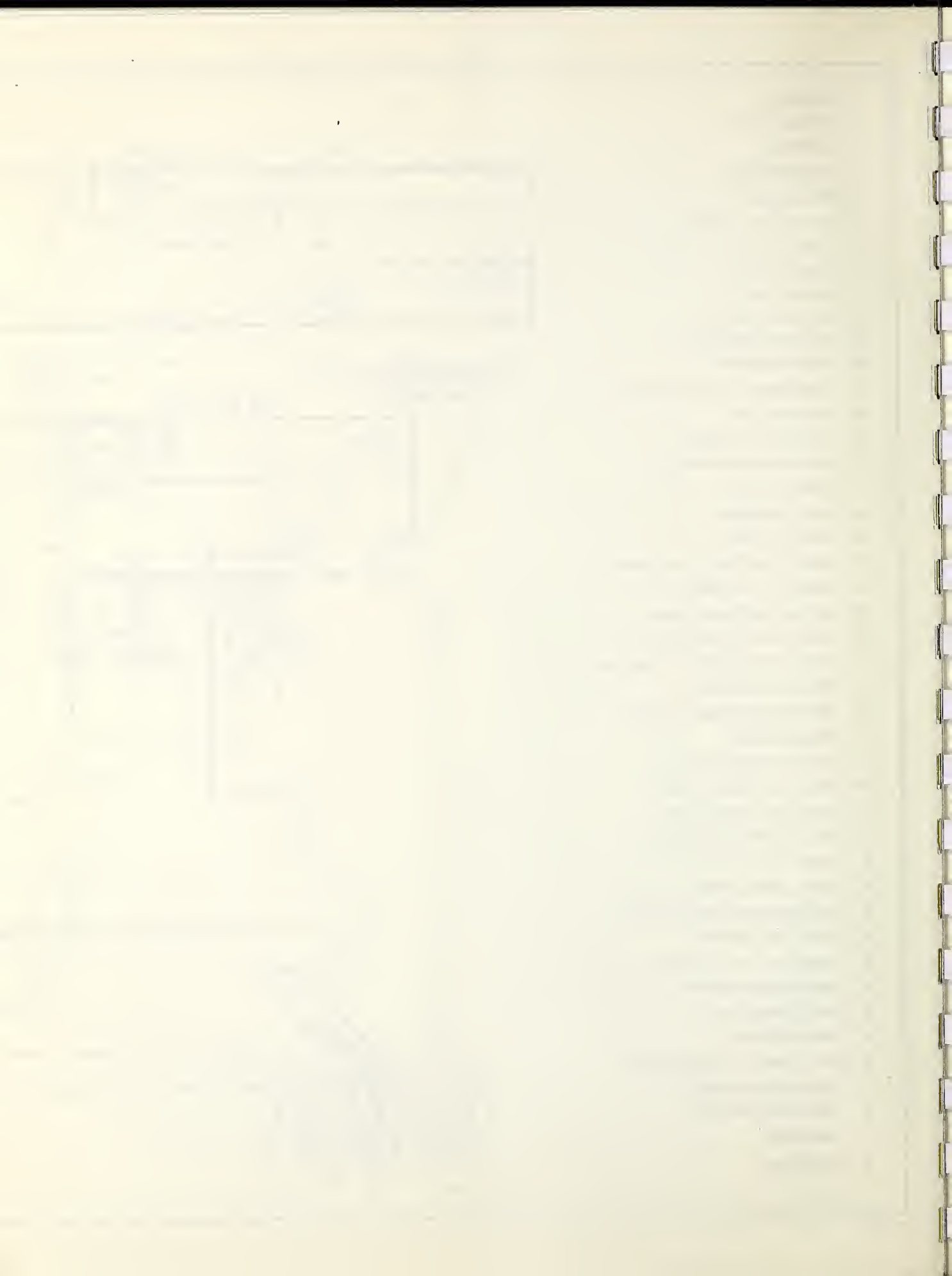
**SCHEMATIC LAYOUT
OF FORT WAYNE
MATERIALS RESOURCE
RECOVERY FACILITY**

JUNE 1971

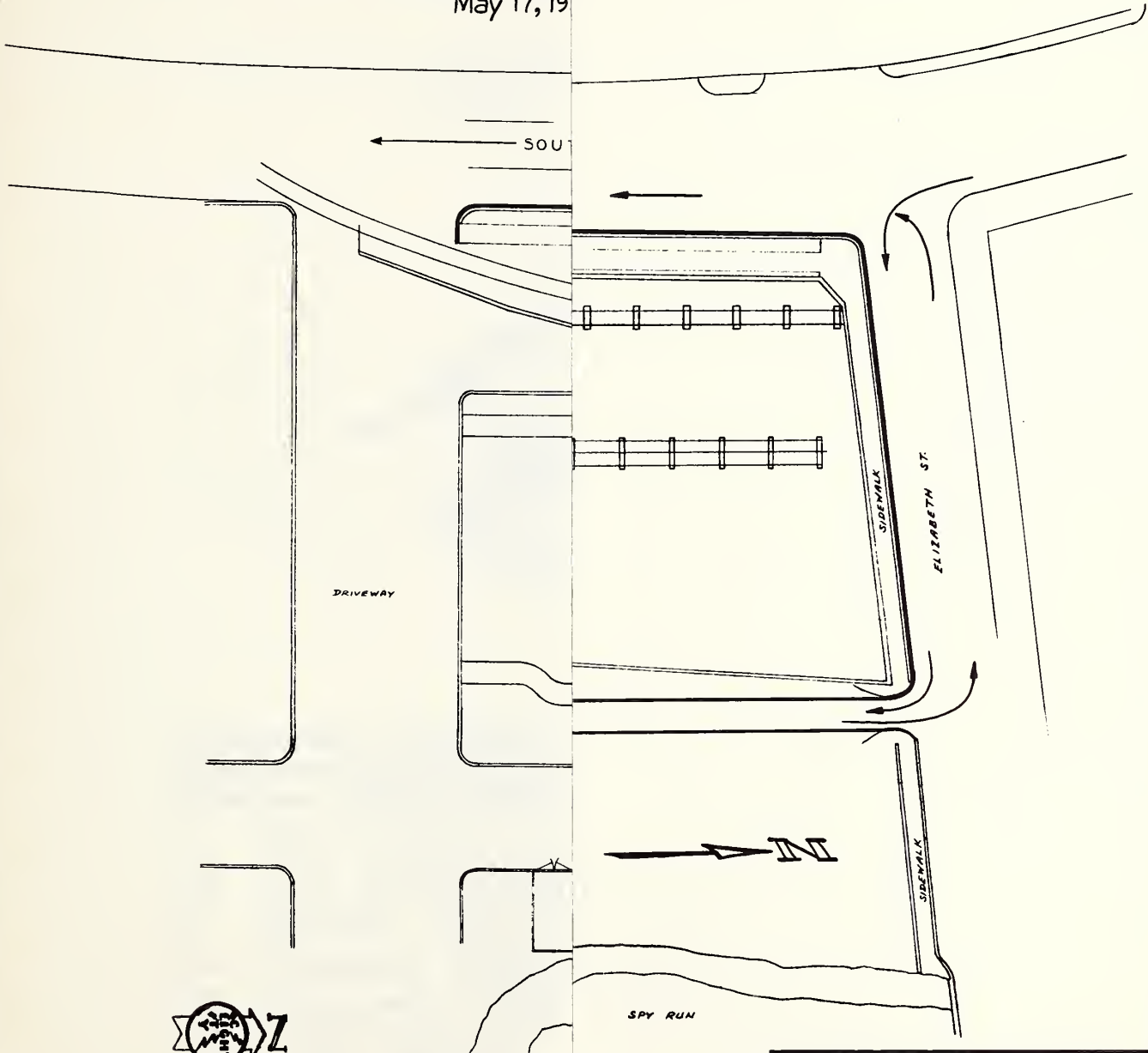


**NATIONAL
RECYCLING
CORPORATION**

3225 OLD MAUMEE ROAD
FORT WAYNE, INDIANA 46803
PHONE (218) 749-9548



Preliminary
cubette receive
May 17, 19



LUNNINGHAM - HINMAN

OWNER AND LOCATION
LIGHT & POWER
ENGINEERING DEPARTMENT
FORT WAYNE, INDIANA

Receiving and Unloading

FORT WAYNE ^{TITLE} POWER PLANT
SITE LAYOUT

MD-137

JOB NO.
545-101

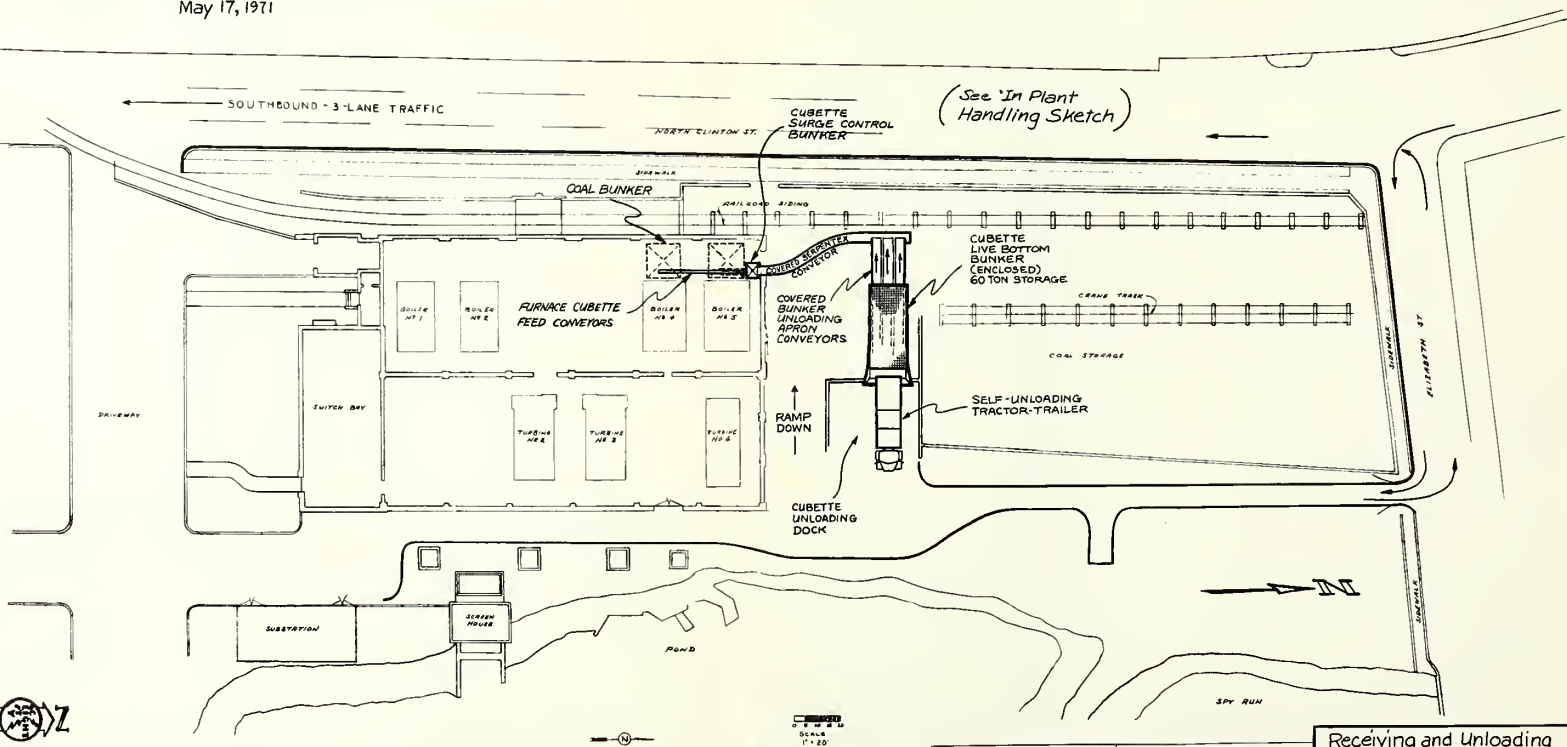
DESIGNER NO.
MX-G2

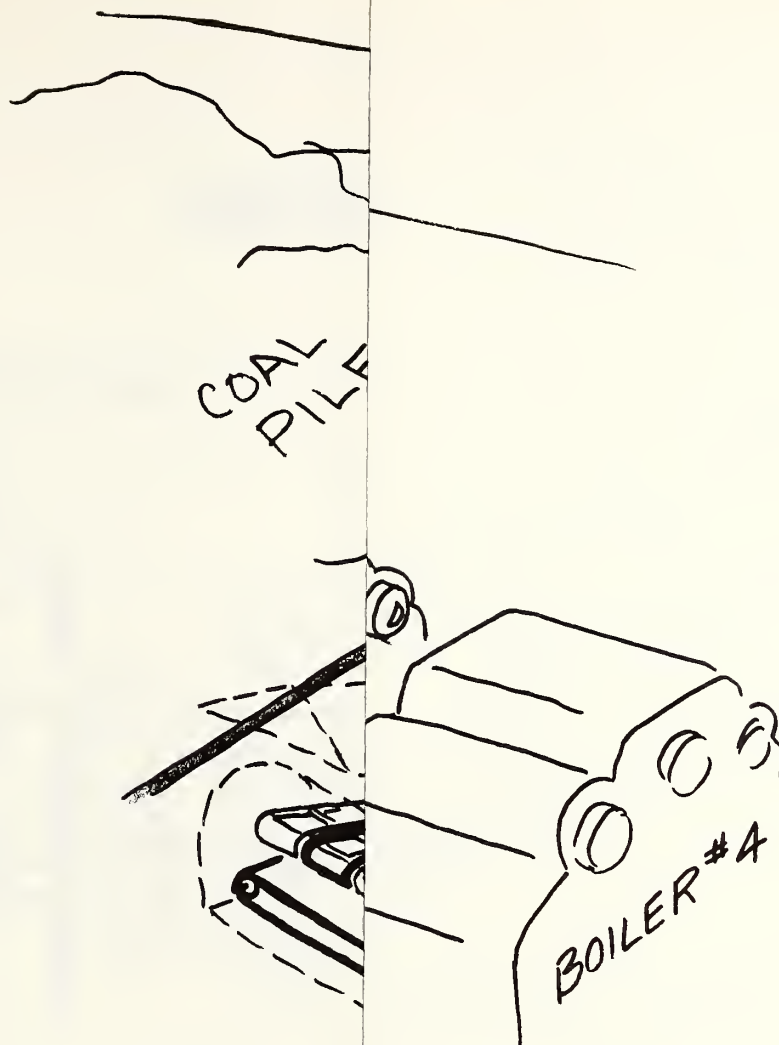
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L2-N O.K. TO FILE

cubette receiving, unloading, storage and handling
May 17, 1971

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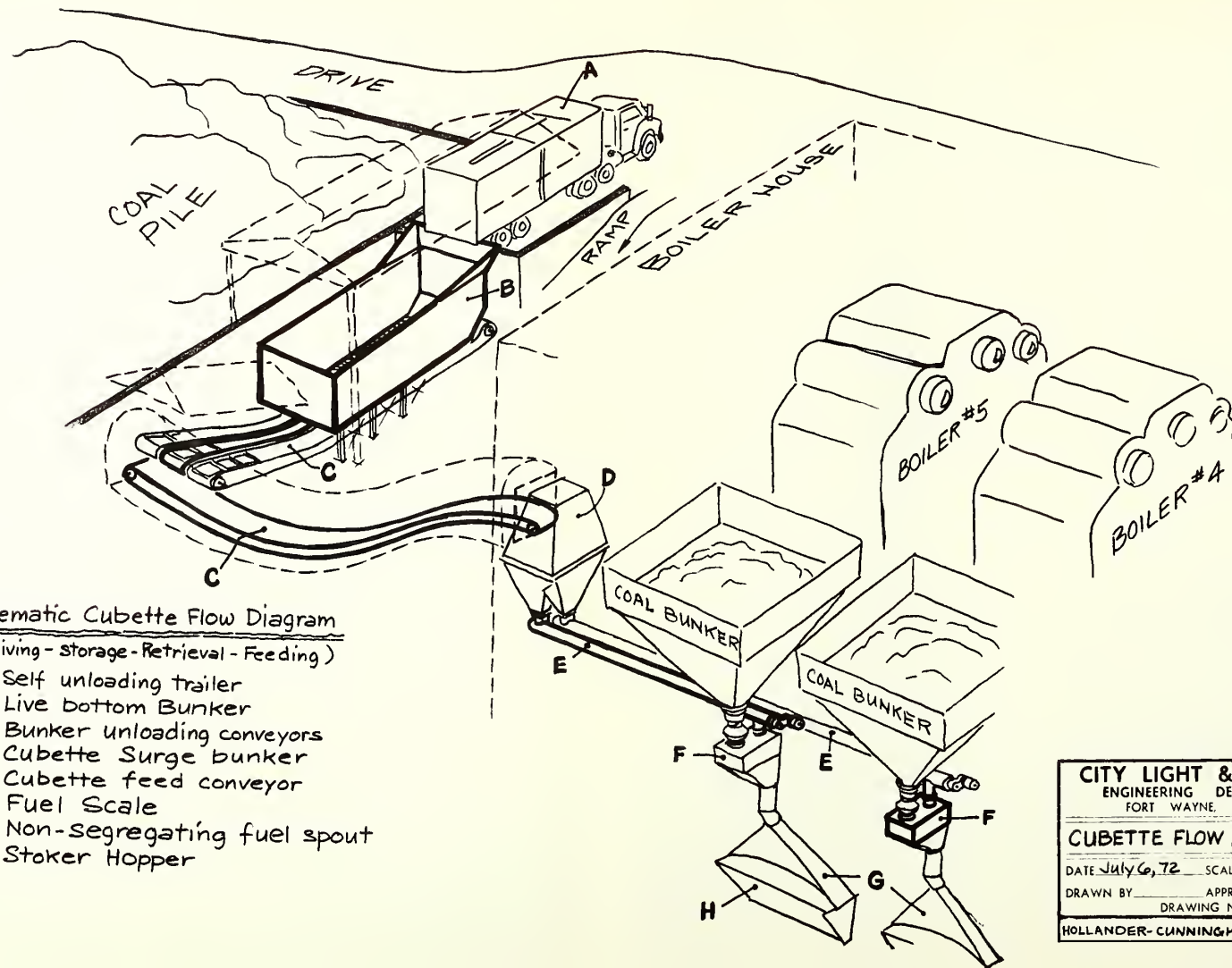


Schematic Cubette

(Receiving - storage - Retri)

- A. Self unloading to
- B. Live bottom Bu
- C. Bunker unloading
- D. Cubette Surge
- E. Cubette feed
- F. Fuel Scale
- G. Non-segregat
- H. Stoker Hopper

CITY LIGHT & POWER	
ENGINEERING DEPARTMENT	
FORT WAYNE, INDIANA	
CUBETTE FLOW DIAGRAM	
DATE July 6, 72	SCALE
DRAWN BY	APPR. BY
DRAWING NO.	
HOLLANDER-CUNNINGHAM-HINMAN	



Schematic Cubette Flow Diagram

(Receiving - Storage - Retrieval - Feeding)

- A. Self unloading trailer
- B. Live bottom Bunker
- C. Bunker unloading conveyors
- D. Cubette Surge bunker
- E. Cubette feed conveyor
- F. Fuel Scale
- G. Non-segregating fuel spout
- H. Stoker Hopper

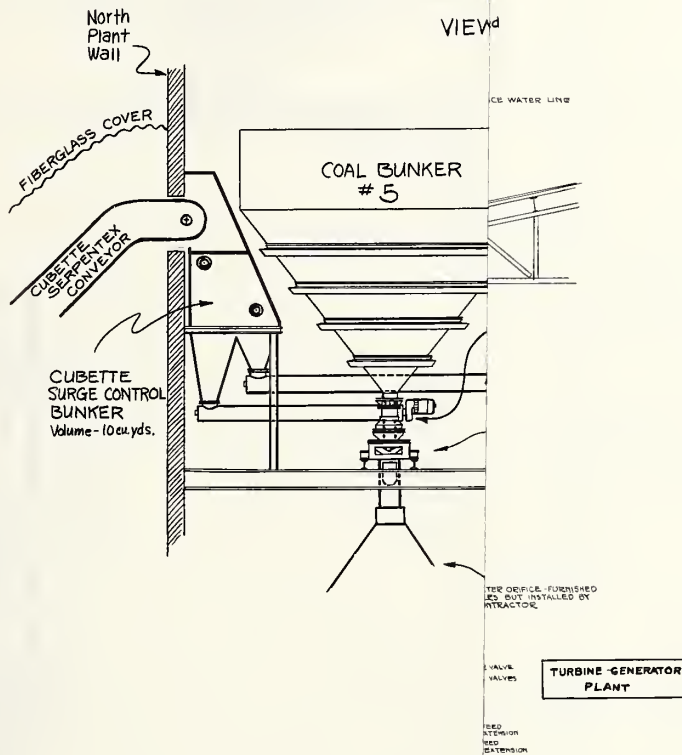
CITY LIGHT & POWER	
ENGINEERING DEPARTMENT	
FORT WAYNE, INDIANA	
CUBETTE FLOW DIAGRAM	
DATE July 6, 72	SCALE
DRAWN BY	APPR. BY
	DRAWING NO.
HOLLANDER-CUNNINGHAM-HINMAN	



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tion

Preliminary Feed
Handling and Metering

(See Receiving and
Unloading Sketch)

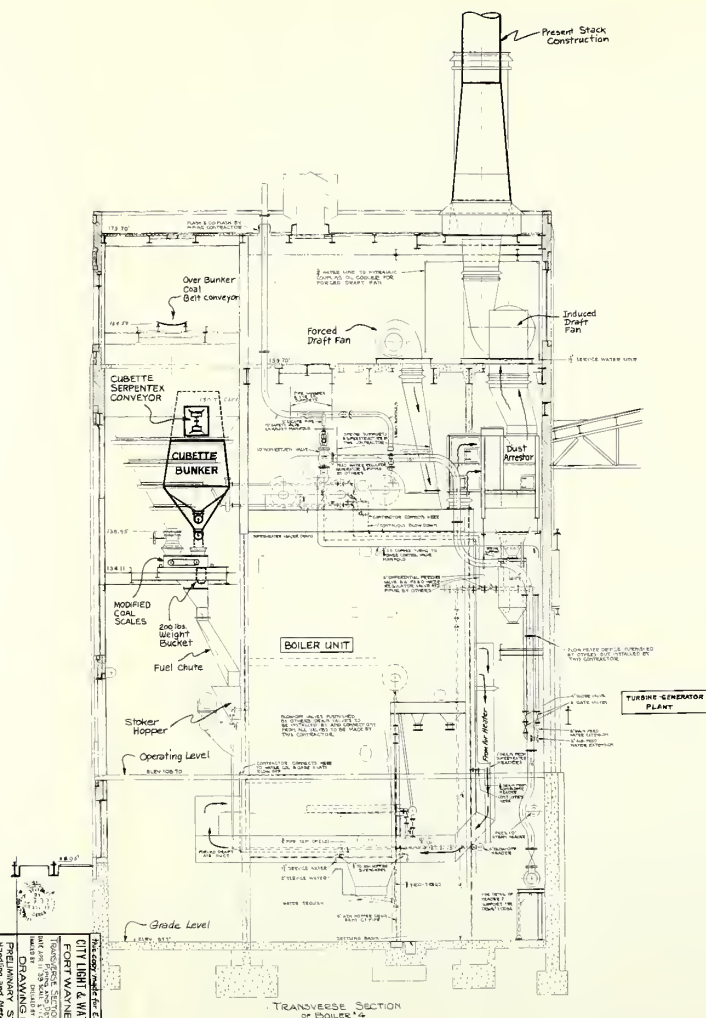
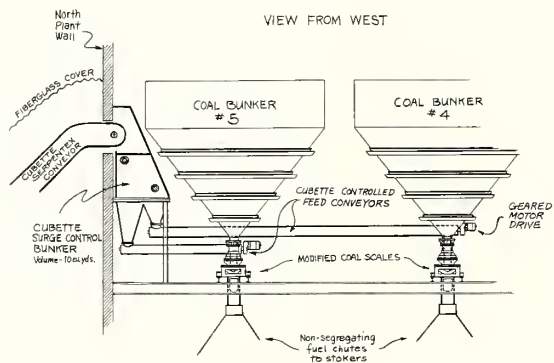


Plant Handling



Handling and Metering of Coal and or Cubettes
May 1971

VIEW FROM WEST



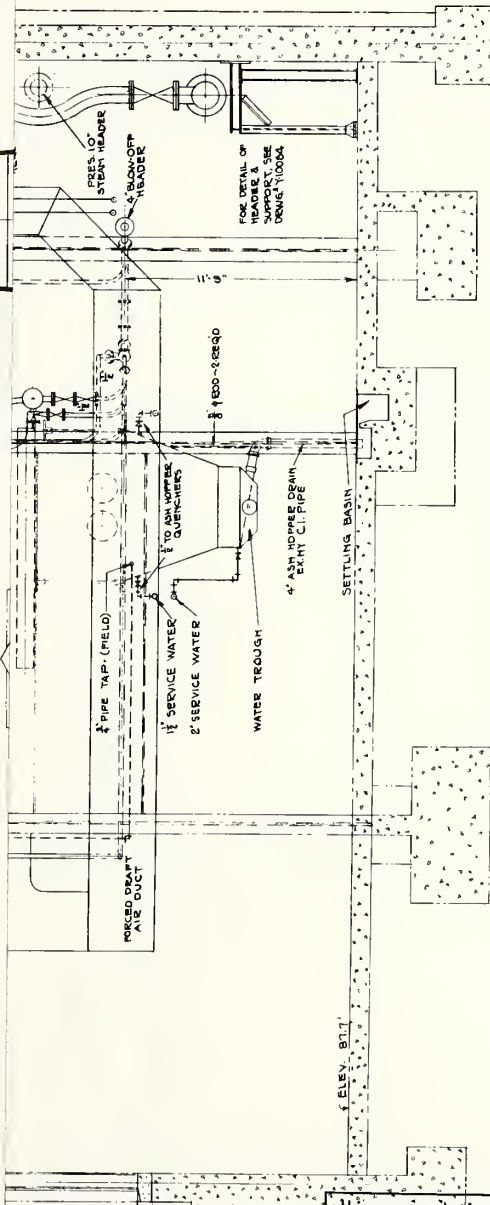
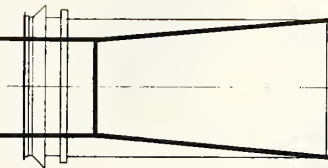
In Plant Handling

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 ROADSIDE SECTION OF BOILER #4
 CITY LIGHT & WATER UTILITIES
 FORT WAYNE, INDIANA
 PRELIMINARY STUDY
 Handling and Metering of
 Coal and/or Cigarettes
 May 71
 DRAWING NO. 10092
 DESIGNED BY
 CHECKED BY
 APPROVED BY
 DATE JAN. 17, 1978
 REVISIONS
 REWORKED - COMPLETED - IN HAND

PRELIMINARY FEASIBILITY STUDY A

Air Pollution Control Equipment Application
Hi-Efficiency Multi-clone Collector
May 1971

PRESENT STACK



TRANSVERSE SECTION
OF BOILER #4

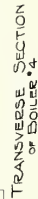
HINMAN

98.05'

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CITY LIGHT & WATER UTILITIES FORT WAYNE, INDIANA	
TRANSVERSE SECTION OF BOILER #4 PIPING AND DETAIL	
DATE APR 11, 39	SCALE 1/4" = 1'-0"
TRACED BY	CHECKED BY
DRAWING NO 10082	
PRELIMINARY A.P.C. STUDY A 5/71	



Air Pollution Control Equipment Application
Hi-Efficiency Multi-clone Collector
May 1971



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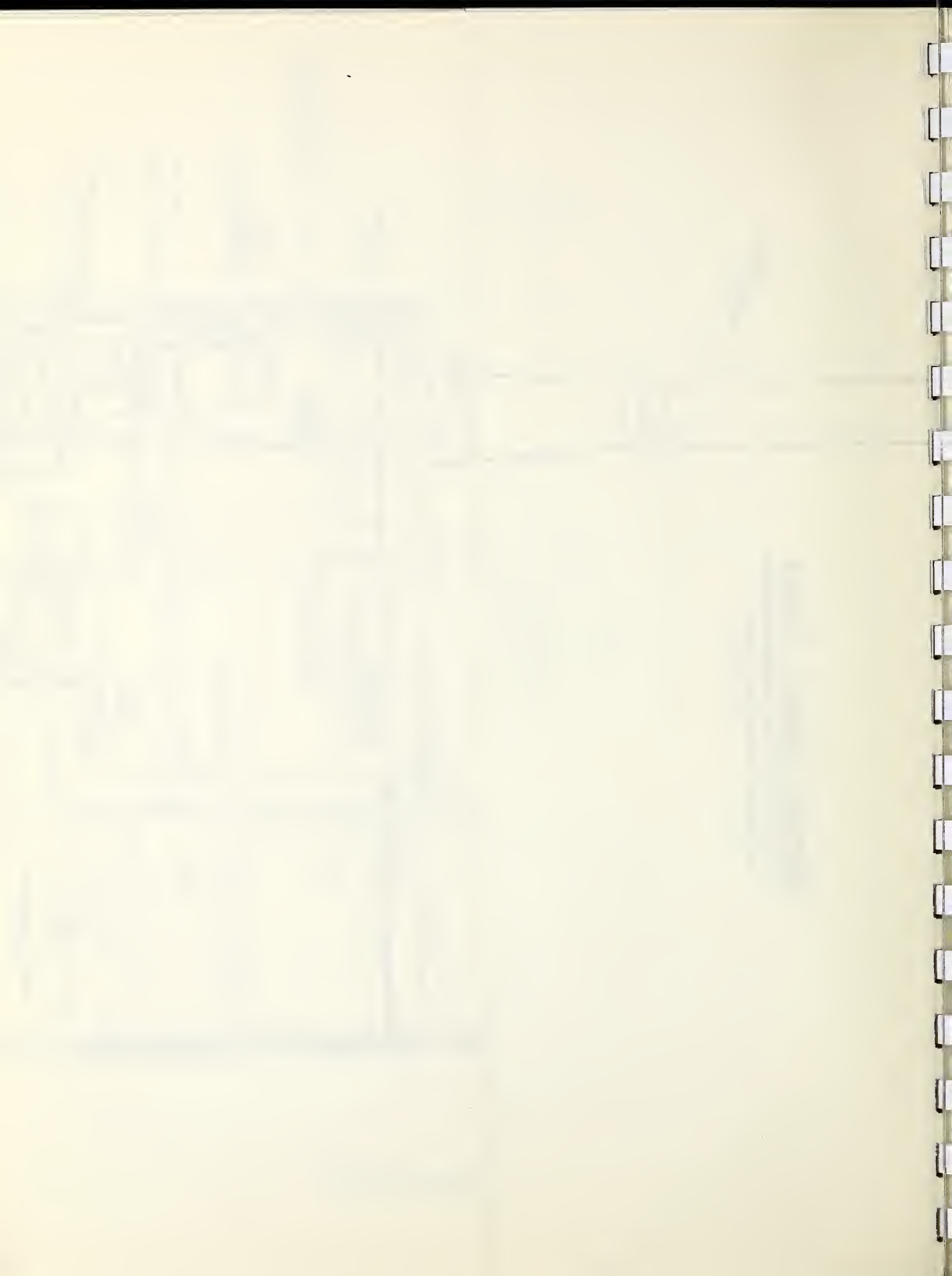
CITY LIGHT & WATER UTILITIES
FORT WAYNE, INDIANA

TRANSVERSE SECTION OF BOILER #4
PIPING AND DETAIL

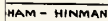
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DRAWING NO 10082

PRELIMINARY A.P.C. STUDY A 5/71

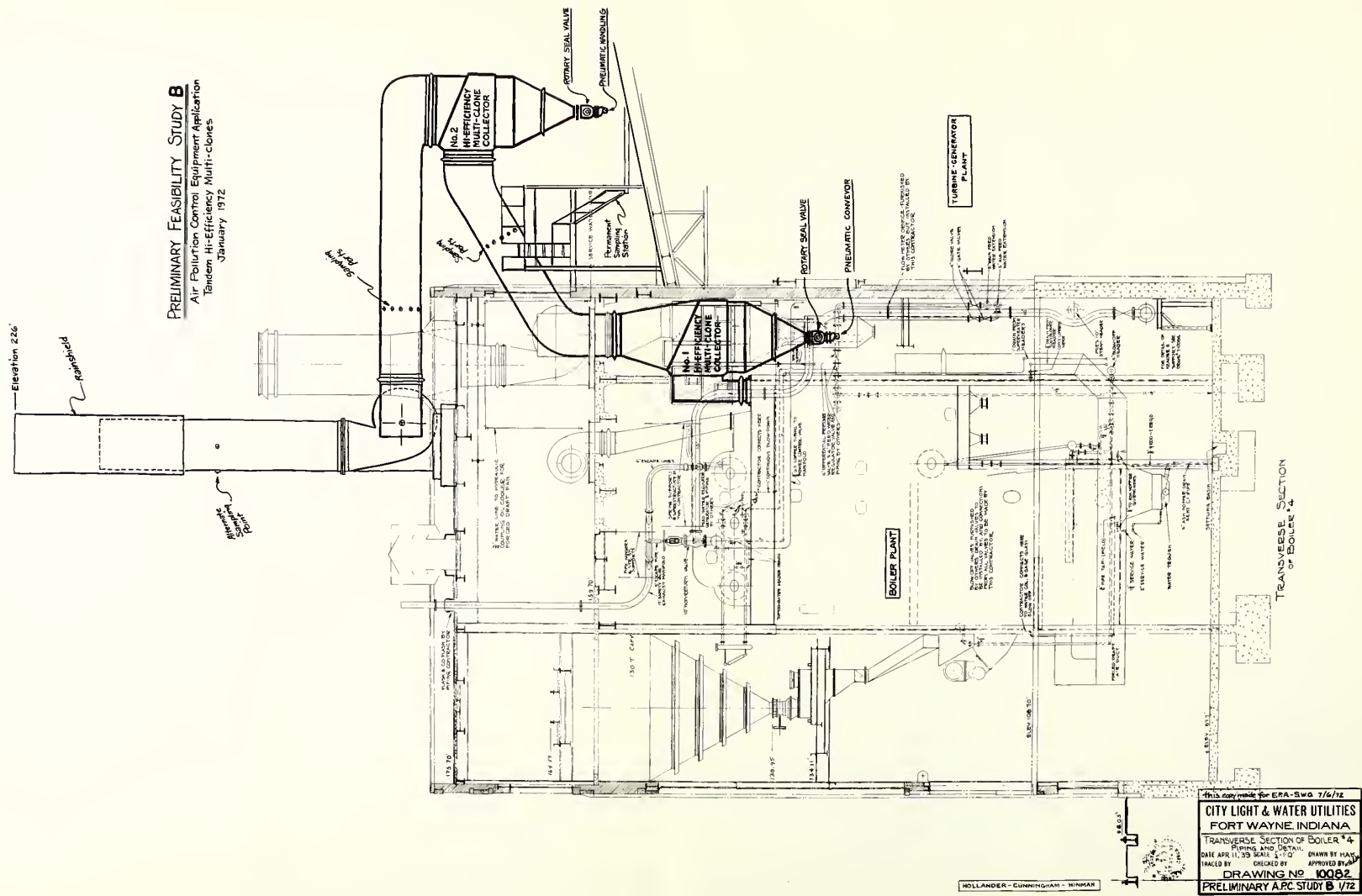


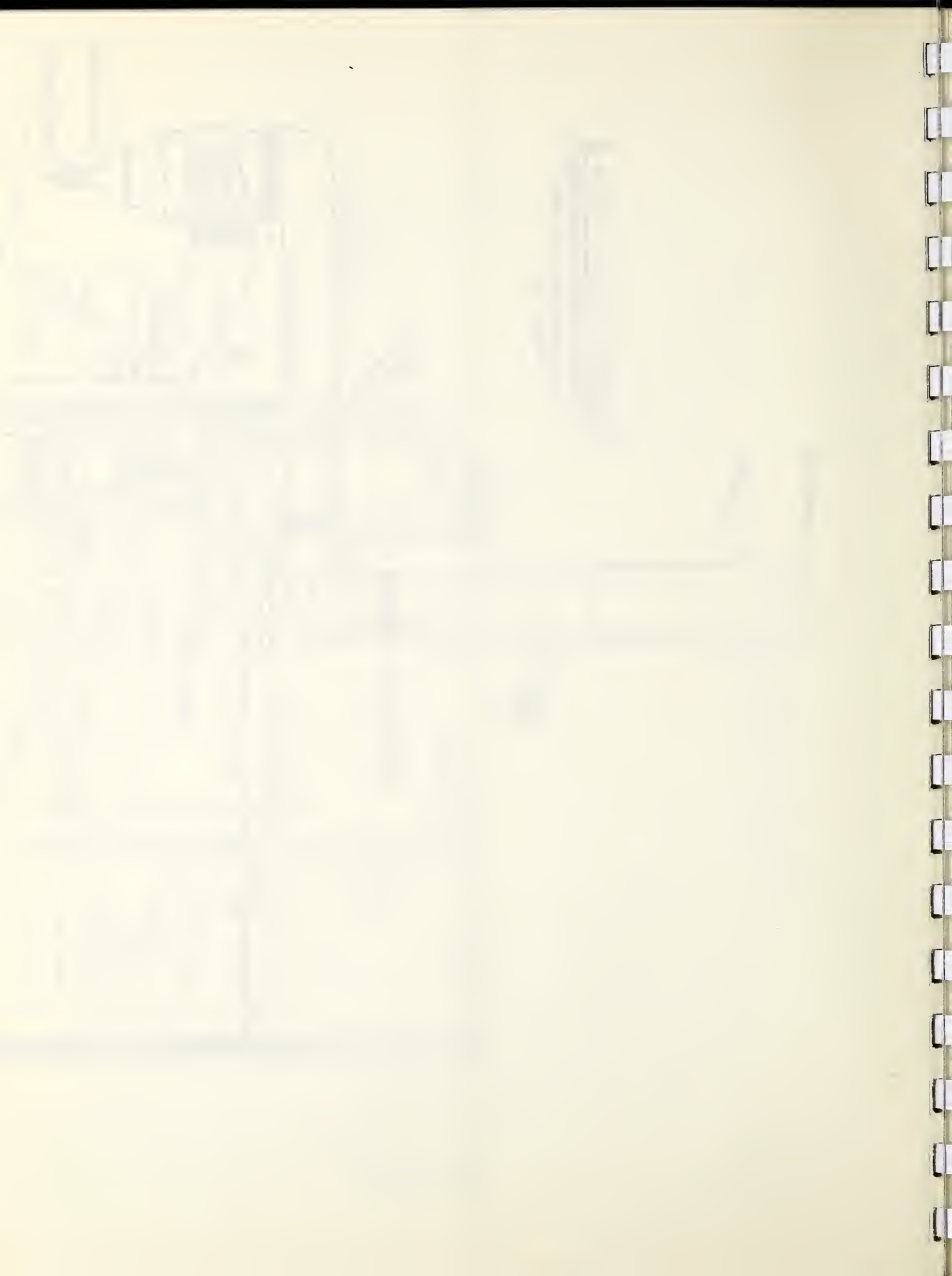
January 1972





**Air Pollution Control Equipment Application
Tandem Hi-Efficiency Multi-clones
January 1972**



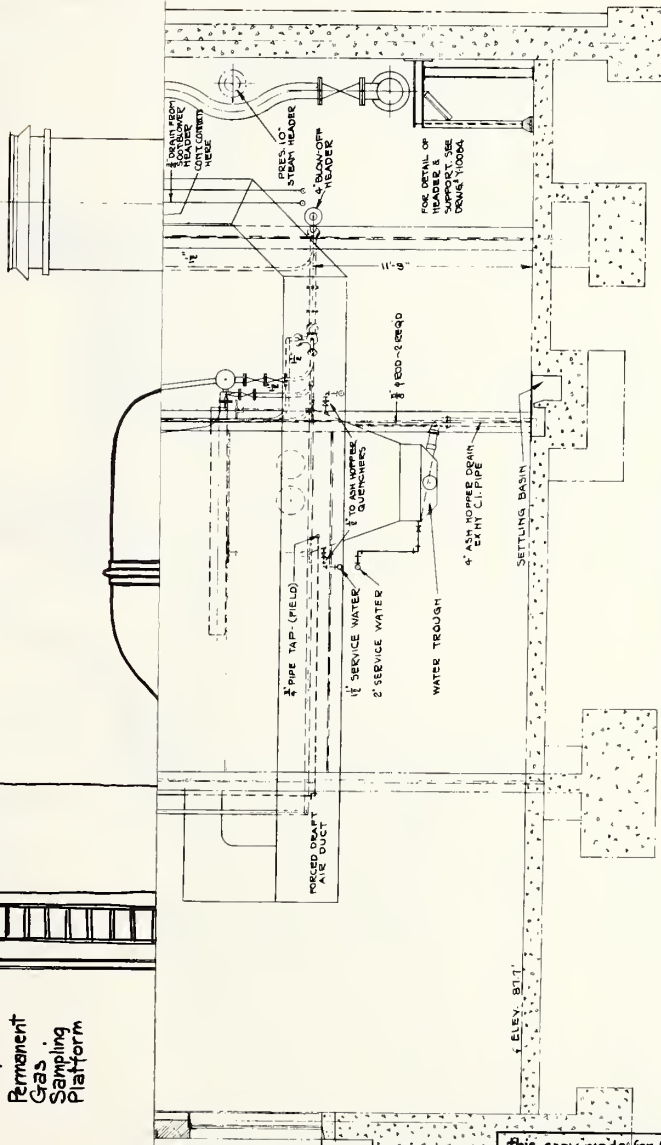


PRELIMINARY FEASIBILITY STUDY C Air Pollution Control Equipment Application Tandem Hi-Efficiency Multi-clones January 1972

Elevation 226'

Rainshield

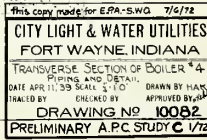
Permanent Gas Sampling Platform

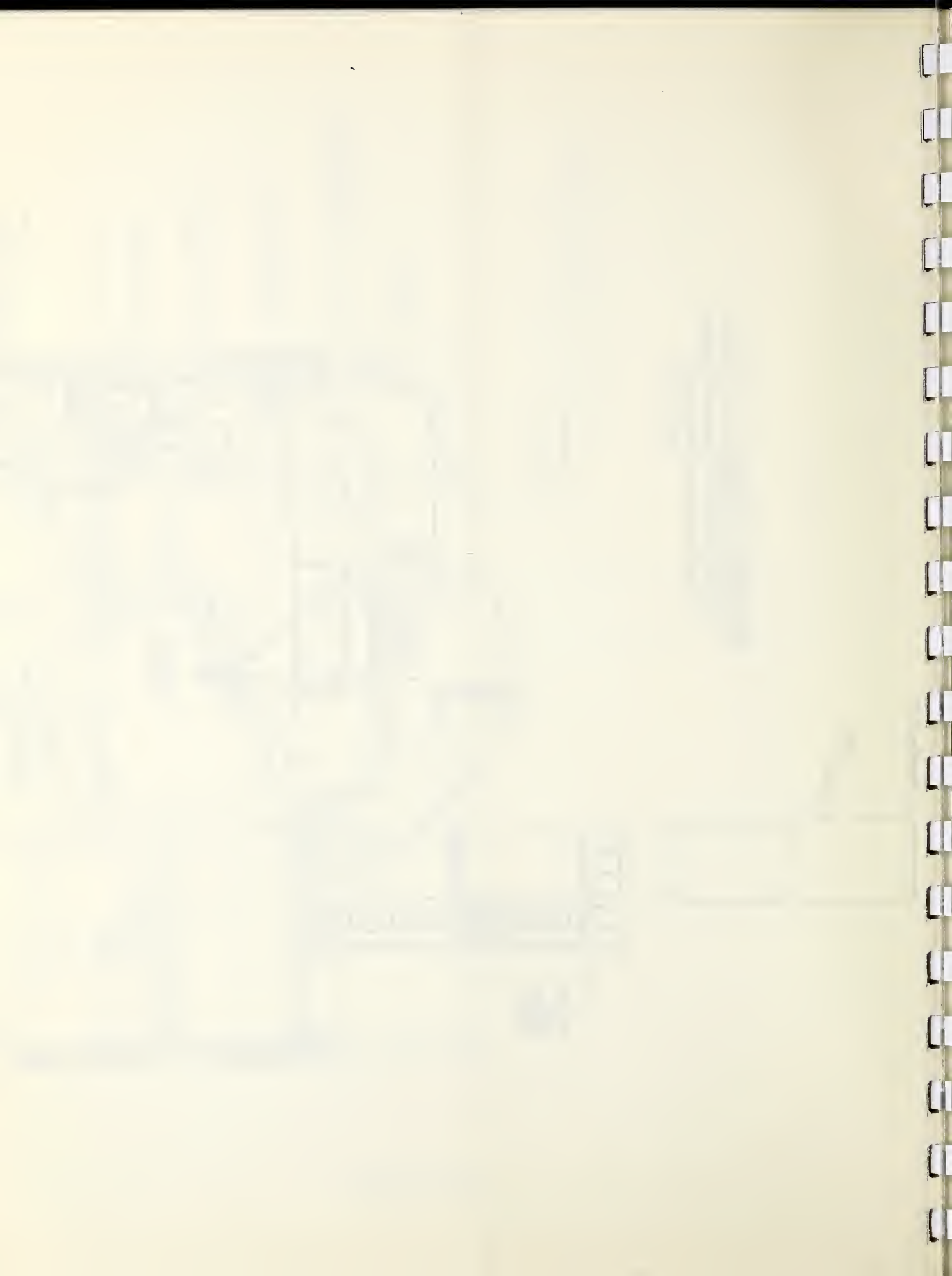


TRANSVERSE SECTION OF BOILER #4

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TRANSVERSE SECTION OF BOILER #4 PIPING AND DETAIL		
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PRELIMINARY A.P.C. STUDY C 1/72		

HINMAN

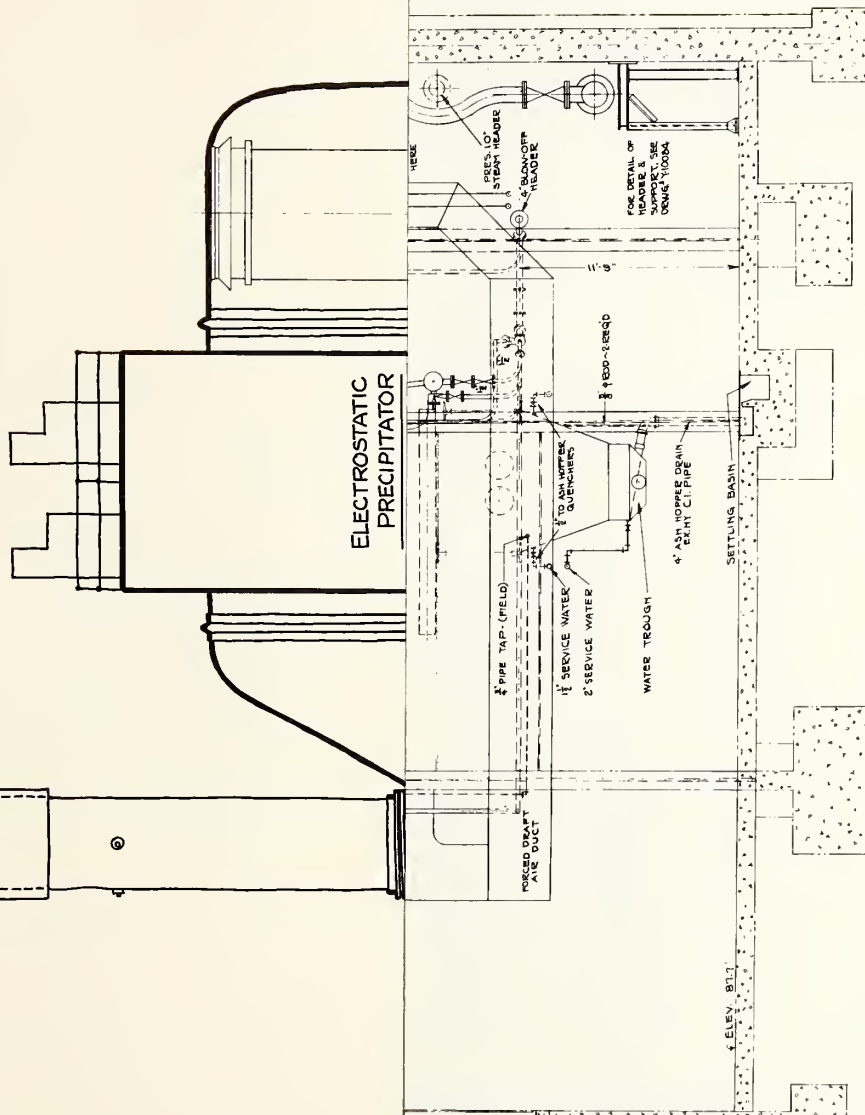
Multi-clones
January 1972



PRELIMINARY FEASIBILITY STUDY D

Air Pollution Control Equipment Application
Electrostatic Precipitator
January 1972

← Rainfield

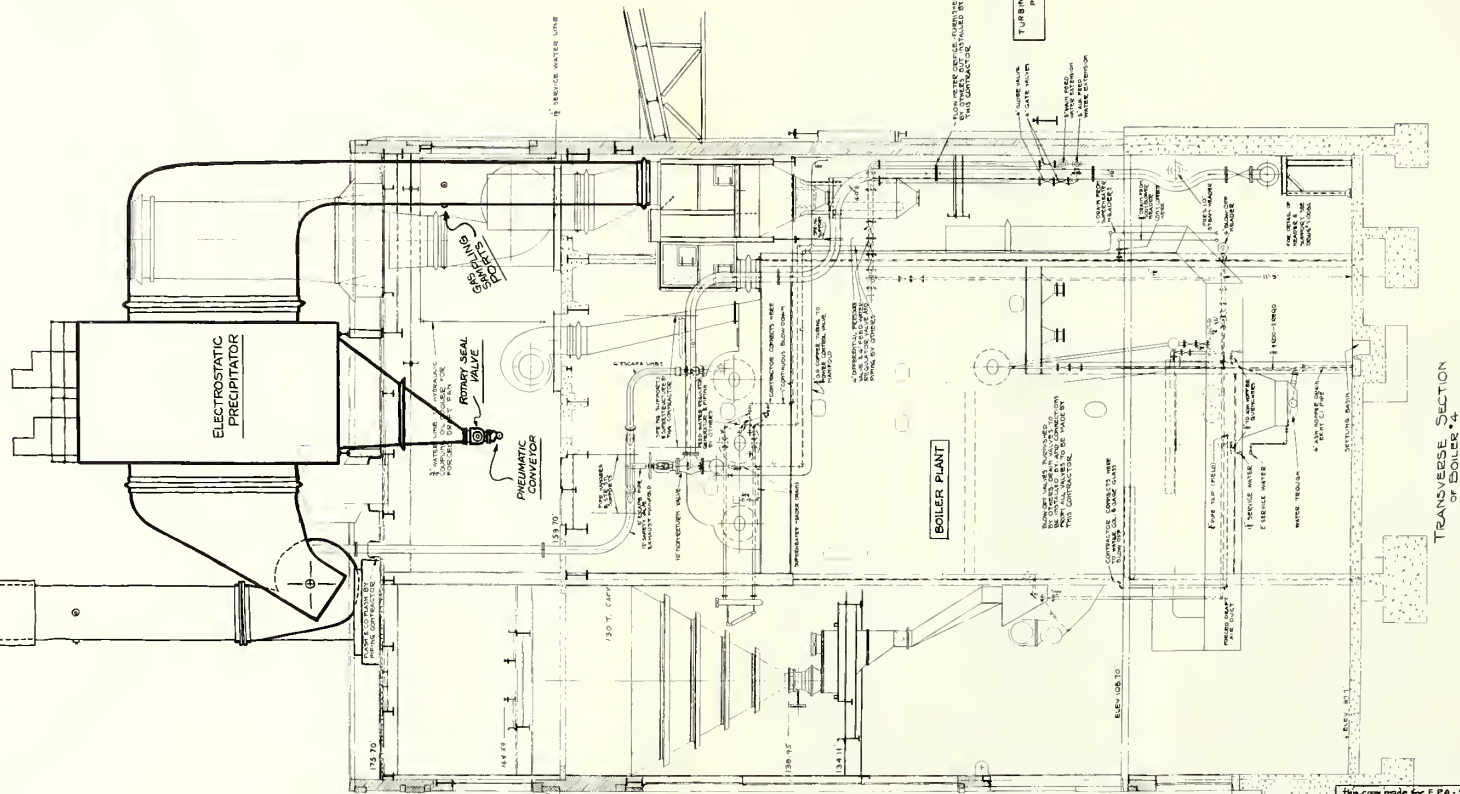


TRANSVERSE SECTION
OF BOILER #4

HINMAN

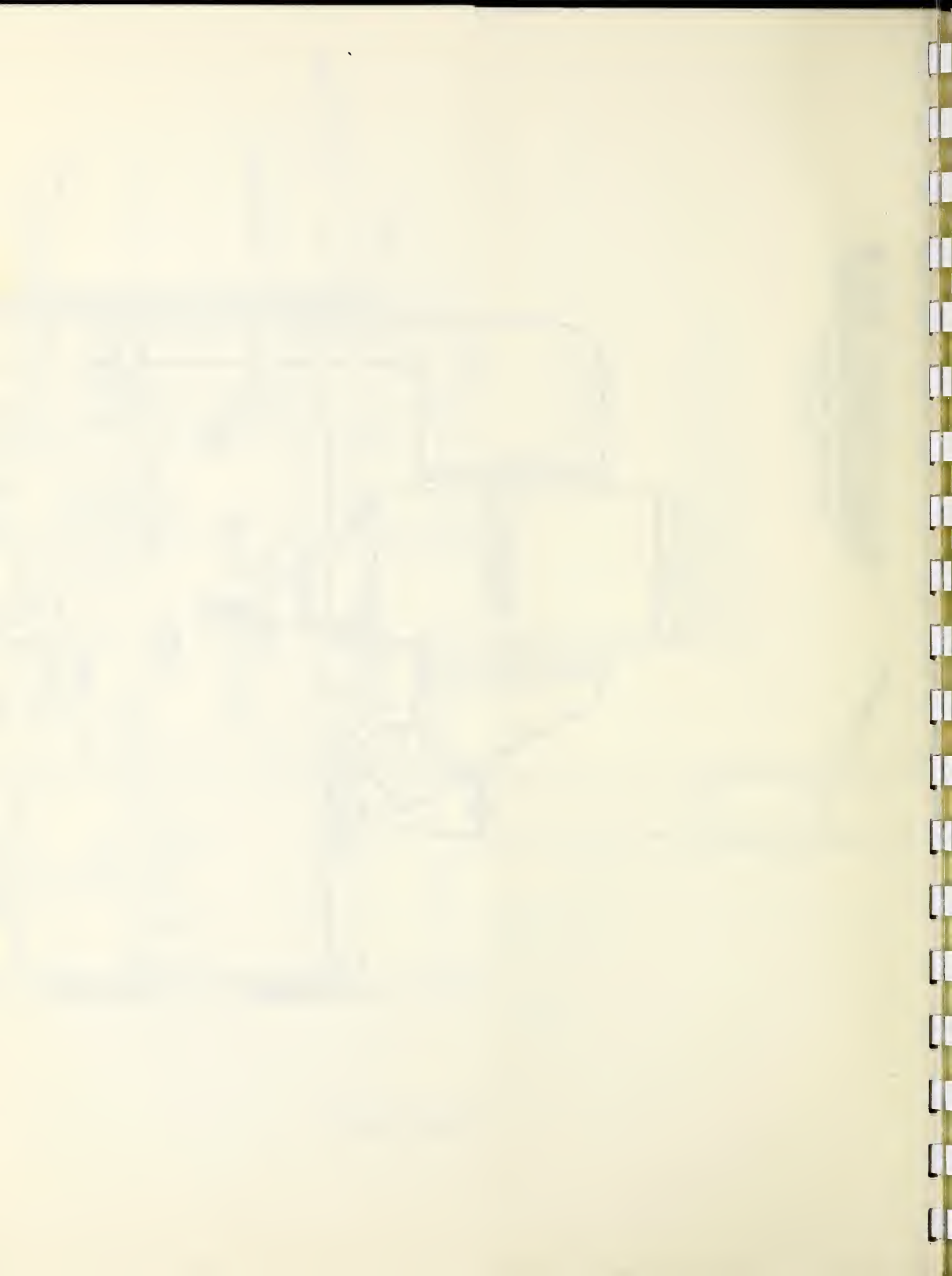
this copy made for E.P.A.-S.W.O. 7/6/72		
CITY LIGHT & WATER UTILITIES FORT WAYNE, INDIANA		
TRANSVERSE SECTION OF BOILER #4 PIPING AND DETAIL		
DATE APR 11, 39	SCALE 1/4" = 1'-0"	DRAWN BY HAK
TRACED BY	CHECKED BY	APPROVED BY
DRAWING NO 10082		
PRELIMINARY A.P.C. STUDY D 1/72		

PRELIMINARY FEASIBILITY STUDY D
Air Pollution Control Equipment Application
Electrostatic Precipitator
January 1972



This copy made for EPA, SWD 7/6/72
CITY LIGHT & WATER UTILITIES
FORT WAYNE, INDIANA
TRANSVERSE SECTION OF BOILER #4
DATE APR. 11, 1972 SCALE 1/4" = 1'-0"
DRAWN BY H.A. CHECKED BY J.A. APPROVED BY J.A.
DRAWING NO. 10082
PRELIMINARY A.R.C. STUDY D 1/72

HOLLANDER - CUNNINGHAM - HINMAN



ECONOMIC FEASIBILITY REVIEW

Comparison of Solid Waste Disposal System Alternatives

A practical and economic comparison of existing and potential solid waste disposal alternatives has been made. Five alternatives were considered, including:

- Proposed Program: City of Fort Wayne - National Recycling Corporation
- Present System of National Recycling Corporation
- Present Contract: City of Fort Wayne - National Serv-All Corporation
- Incineration: (reactivate or construct)
- Emerging Experimental Systems: Kiln Pyrolysis, Slagging Pyrolysis, others

The attached exhibit entitled:

GREATER FORT WAYNE - SOLID WASTE DISPOSAL SYSTEM ALTERNATIVES CONSIDERED depicts graphically each of the alternatives.

When making this comparison, several assumptions had to be made, since valid data has not been developed or made available for each specific increment of the various alternative systems. While an exhaustive, detailed evaluation and analysis of each increment may ultimately prove some basic assumptions as weak, it is felt the comparison is relevant because such errors probably would be proportional to each.

In this economic comparison, we have addressed ourselves primarily to the cost of disposal. There is full recognition of the significant impact which collection and transport has on total cost. Although there is some difference in these costs for the different alternatives principally because of disposal site locations, the situation in Fort Wayne does not warrant this accounting at the present. The site location for the proposed program is such that an accounting for transportation would make it even more attractive.

ECONOMIC FEASIBILITY REVIEW (CONTINUED):

Present System of National Recycling Corporation

National Recycling Corporation is presently receiving and processing approximately 300 tons of waste per day. The variability in waste character and the fluctuating demands of the secondary materials markets are major factors influencing the portions of material NRC extracts for market. The Fort Wayne Program will provide them with another alternative outlet for resource values, and further incentive to extend their recycling capability. However, the circumstances at the moment only warrant scalping the corrugated from the wastes they receive with the balance directed to their sanitary landfill.

At this time, National Recycling Corporation imposes a disposal charge of \$4.00 per ton of waste received. Assuming that this would also be a cost basis for landfill disposal, the net cost of the present NRC processing system would be \$1.90 per ton. This is based on the assumption that the corrugated salvage would be 10% of the raw waste received and yields a net income of \$1.50 per ton of raw waste. The remaining 90% of the waste received would then represent a \$3.60 cost per ton when landfilled. Therefore, the difference between the \$4.00 disposal charge plus the \$1.50 corrugated salvage income and the actual \$3.60 landfill disposal cost would be a net of \$1.90.

The fundamental economic potential is apparent: If the waste stream were processed further to provide another reuse fraction of cellulosic fibre (say 10% or 200 lbs.) valued at even 50¢/Tons Raw Municipal Waste (TRMW), and another fraction as ferrous (say 10% or 200 lbs.) providing as little as \$1.00/TRMW revenue, and the residual (with ceramics/dirt removed) formed into fuel cubettes, the flow and cost for landfill would only be required as a contingency measure. The actual tonnage to the landfill would have dropped from 90%/TRMW to well below 20%/TRMW.

CITY OF FORT WAYNE, INDIANA

ECONOMIC FEASIBILITY REVIEW (CONTINUED):

Present Contract: City of Fort Wayne - National Serv-All Corporation

The City of Fort Wayne, through its Board of Public Works, provides (thru private contract) solid waste collection and disposal to its residential community. The present contract is in the second year of its six-year term with the National Serv-All Company. The contract provides that the City will pay National Serv-All a monthly fee calculated on the number of residential units serviced. Compensation covers collection, transportation and disposal in the National Serv-All owned and operated sanitary landfill.

The contract provides for total pick-up whereby citizens place unlimited materials at the curb each week for disposal. This includes, in addition to typical household refuse, leaves, grass clippings, appliances, etc.

The present cost for this service is \$17.08 per residential unit per year. With 63,089 units being serviced, the annual cost is \$1,078,027.03. This amount is adjusted quarterly to compensate for new buildings and demolitions within the city and inflation as determined by the Consumers' Price Index. National Serv-All also accommodates institutional, commercial and some industrial sources.

Collection is provided five days a week by utilizing a fleet of 20 thirty cubic yard compactor trucks. On an average, 680 cubic yards of solid waste is collected and disposed of daily by National Serv-All. Assuming a weight of 600 lbs. per cubic yard of compacted refuse, the daily flow is 204 tons, which is 53,040 tons annually. Utilizing these figures, the cost for this service; - collection, transportation and disposal - is \$20.32 per ton.

National Serv-All does not maintain segregated collection/landfill disposal cost accounting for their operation. However, they do charge a fee of 65¢ per cubic yard for waste delivered for disposal. Assuming an average weight of 330 lbs. per cubic yard, the cost for landfill disposal would be approximately \$4.00 per ton. This probably represents approximately 20% of his total charge for collection, transportation and disposal, which appears consistent with national averages.

Conclusion:

The cost of disposal for this method is established at \$4.00 per ton. Land areas are diminishing and costs increasing; therefore, this operation can only be considered an attractive interim solution. Other than present modest disposal cost, this operation has no redeeming significance in regard to conservation of materials, energy or land resources or environmental enhancement and can not readily generate cost offsetting revenue.

ECONOMIC FEASIBILITY REVIEW (CONTINUED):

Incineration

The City of Fort Wayne owns a small incinerator. A few years ago, a private corporation leased this facility from the City and installed air pollution control facilities. After approximately one year of operation, they abandoned their lease and ceased operation because of their inability to offer a service to the private collectors at a price competitive with the landfill operators in the area. The incinerator has been moth-balled and it is not expected to be revived. In considering this alternative, the published national averages for incinerator operation of \$8 - \$12 per ton were used, and an additional cost of \$.80 per ton for disposal of the incinerator residue.

Due to its extraordinary high cost, inherent environmental problems, and no attempt to recover our natural resources, this alternative was discounted as unfavorable.

Emerging Experimental Systems - Kiln Pyrolysis, Slagging Pyrolysis, et al

Other systems were considered; however, they were found to be too experimental in terms of the state of the art of solid waste disposal. The Kiln Pyrolysis system was quickly discounted when noting the minimum refuse required for the projected practical plant is 1,000 tons per day. The Slagging Pyrolysis system is interesting, but very experimental, and we are awaiting the results of the EPA-Torrax evaluation.

Due to the experimental status of these systems, no attempt was made to establish a cost per ton. However, it is the considered opinion that such cost will logically be far in excess of the system proposed by the City of Fort Wayne.

ECONOMIC FEASIBILITY REVIEW (CONTINUED):Proposed Program: City of Fort Wayne - National Recycling Corporation

The proposed program, the subject of this application, essentially represents a broadening of the existing herein described processing system of the National Recycling Corporation facilities. The proposed program would make full utilization of National Recycling's existing separation-classification-beneficiation facilities, and the added processing elements to produce the beneficiated cubetted salvage fuel from the residuals emanating from the normal process. All material resources fractions for which there are markets would be recovered. The following is considered to be realistic estimates of the materials to be recovered and the values attributed on a per Ton of Raw Municipal Waste basis (TRMW).

BASIC ASSUMPTIONS

	<u>Market Value</u>	<u>Net Income</u>	
	<u>\$/Ton Fibre</u>	<u>\$/Ton Fibre</u>	<u>\$/TRMW</u>
No. 1 Grade Corrugated Fibre	\$25	\$15	\$1.50
Clean Mixed Fibre "Mixcor"	10	5	0.50
Magnetically Separated Ferrous	15	10	1.00
Landfill disposal of combustible residual from process			\$2.40/TRMW
Beneficiated Cubettes - energy value			4.50/TRMW
Shredder, conveyor - (owning, operating cost)			4.10/TRMW

RAW MUNICIPAL WASTE (RMW)

<u>'Process</u>	<u>Composition</u>	<u>Value Attributed</u>
<u>Composition-%</u>	<u>Segment</u>	<u>\$/Ton RMW</u>
10	No. 1 Corrugated Fibre (hand picked)	\$1.50
10	Refined Fibre "Mixcor" -(after shredding)	0.50
10	Ferrous materials (magnetically separated)	1.00
10	Glass and Ceramics - (mixed)	undefined as yet
60	Beneficiated Cubettes - energy value	4.50
—	- delivered fuel value	1.60
100		

ECONOMIC FEASIBILITY REVIEW (CONTINUED):

Proposed Program: City of Fort Wayne - National Recycling Corporation
(continued)

COST ASSUMPTIONS

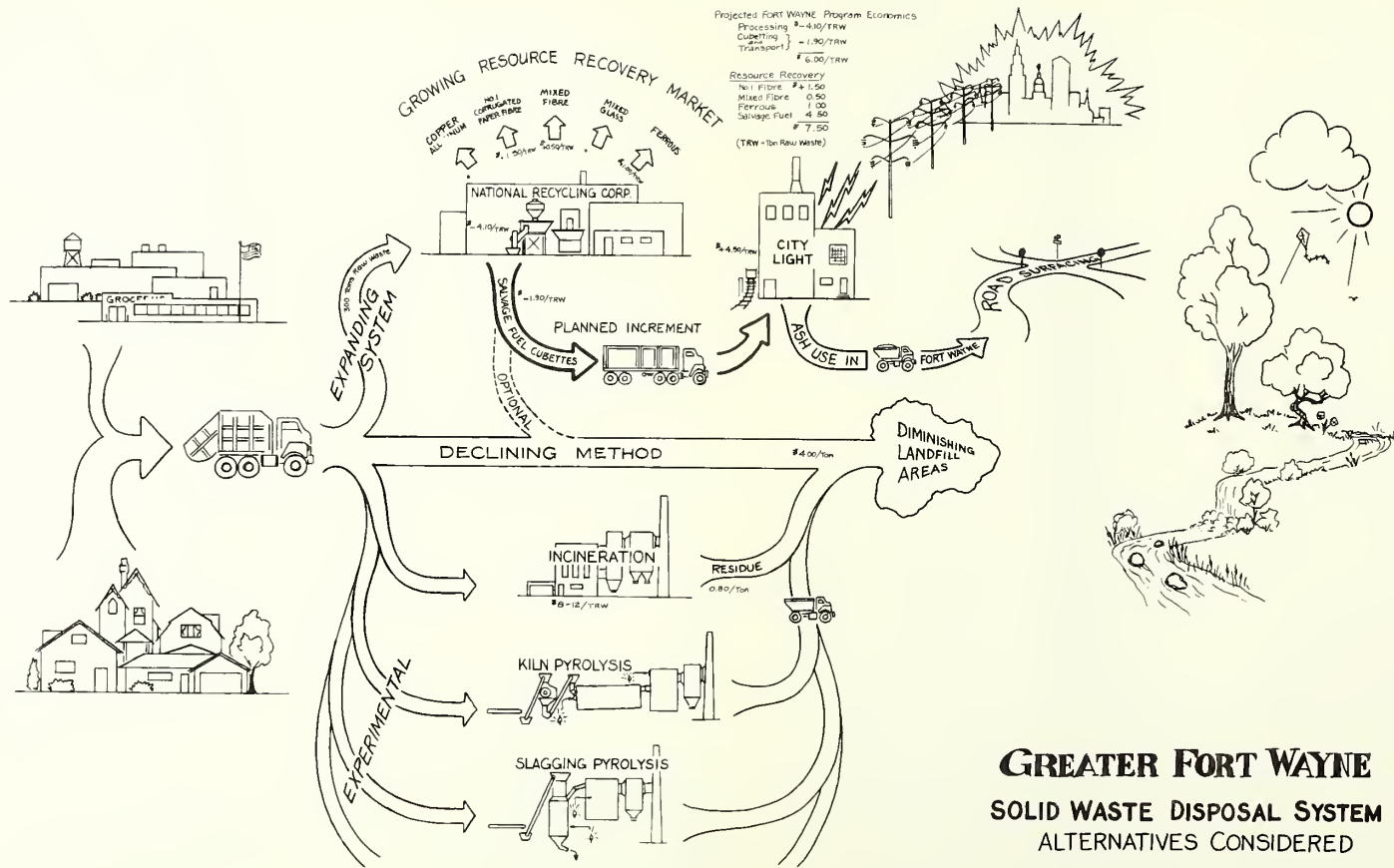
Shredding and plant separation processing	\$4.10/TRMW
Cubette production and transportation in Fort Wayne	2.90/TRMW
Optional landfill for disposal of process residual	2.40/TRMW

Although the above values are based on assumptions requiring corroboration, review of the options, accountabilities and assignments reveals that a materials salvage plant can become economically viable if the cost of process residual disposal can be avoided.

Any revenue from the residual waste product converted to an energy-value 'by-product' would provide additional incentives to SMI for greater involvement. At this time, under the circumstances now prevailing in Fort Wayne, to have the energy-value 'by-product' attractive as a fuel commodity, only a fraction of the cost of the shredding operation should be assigned. For the one-year performance evaluation term, National Recycling Corporation has agreed to furnish beneficiated material at no cost for the cubette forming and utilization operation. However, total cost data will be developed.



RT WAYNE
POSAL SYSTEM
CONSIDERED



GREATER FORT WAYNE

SOLID WASTE DISPOSAL SYSTEM

ALTERNATIVES CONSIDERED

PRELIMINARY ECONOMIC REVIEWRELATIVE FUEL VALUE OF CUBETTES

NRC Receiving and Processing 300 Tons Fort Wayne Waste in 10 hour day or
78,000 tons per year (180 tons Mixed Municipal Waste + 120 tons Industrial Waste)

Recycling Plant Residual for Cubettes or Discard

* - 60% from Mixed Municipal Waste	= 108 Tons Per Day	= 28,080 Tons Per Year
- 30% from Industrial Waste	= 36 Tons Per Day	= 9,360 Tons Per Year
Totals:	144 Tons Per Day	37,440 Tons Per Year

Relative Fuel Value

Coal - 12,000 BTU/Lb.	= 24,000,000 BTU Per Ton
Cubettes - 6,500 BTU/Lb.	= 13,000,000 BTU Per Ton

One Ton Cubettes	= 0.54 Tons Coal Equivalent
	= 0.54 X \$14 Per Ton Coal

One Ton Cubettes	= \$7.60 Coal Equivalent
	= \$4.50 Per Ton Unprocessed Mixed Municipal Waste

108 Tons Per Day Muni Cubettes	= \$820 Per Day
--------------------------------	-----------------

144 Tons Per Day Combined Cubettes	= \$1,090 Per Day
------------------------------------	-------------------

Based on 5 Day X 42 Weeks	= 260 Days Per Year
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Displaced Coal Fuel Cost

260 Days Per Year @ \$820 Per Day	= \$213,200 - Corresponds to 28,080 Tons Per Year
260 Days Per Year @ \$1,090 Per Day	= \$283,400 - Corresponds to 37,440 Tons Per Year

Qualification

The relative coal per cubette costs involved in receiving, storing, handling, feeding cubettes at the power plant would have to be determined and correlated for a valid fuel value analysis. This determination should include relative equipment maintenance, impact on boiler efficiency, (excess air, exit gas temperature slagging, etc.) operating labor and supervision and stack emissions. Assessments of these various elements can only be made during a well programmed and controlled investigation such as contemplated during the one year period for this project.

* 28,080 Tons Per Year Cubettes
= 60% of 46,800 Tons Per Year Unprocessed Municipal Waste

PRELIMINARY ECONOMIC REVIEWEstimated Cost For Accomodating Cubettes - (Preparation, Transport, Storage, Feeding)

UNPROCESSED Municipal Waste Tonnage Per Year 46,800

OPERATION - (Power, Maintenance, Labor)Cubette Preparation System

Two Cubers - 10 Hours/5 Days/52 Weeks	= 2,600 Hours/Year	
...Power \$3/Hour/Cuber @ 2,600 Hours		\$15,600
...Maintenance @ 25¢ Ton		\$7,020
...Labor* - 2,600 Hours		\$17,550
Total:		\$40,170

Cubette Transportation

Three - Transfer Trailers with One Tractor		
...Fuel Oil, Tires and Preventive Maintenance		\$3,315
...Insurance		\$863
...Labor* (2 shifts) - 4,160 Hours		\$28,080
Total:		\$32,258

Cubette Bunkers & Conveyors In City Light Plant

Two/Three Shift Operation		
...Power - 100 Kw X 8,600 Hours @ 2¢ Per Kw hr		\$17,200
...Maintenance @ 5¢ Per Ton		\$1,350
...Labor <u>Shared*</u>		----
Total:		\$18,550

AMORTIZATION + INTEREST @ 5%

<u>Time Period</u>	<u>10 Year</u>	<u>15 Year</u>
- Cubette Preparation System	\$23,763	\$17,418
- Cubette Transportation System	\$12,302	\$9,017
- Cubette Bunker System	\$25,641	\$18,794
Totals:	\$61,706	\$45,229

PRELIMINARY ECONOMIC REVIEWSummary Cost And Fuel Savings For Using Cubettes

<u>UNPROCESSED Municipal Waste Tonnage Per Year</u>	46,800
---	--------

OPERATION - (Power, Maintenance, Labor)

- Cubette Preparation Syetem	\$40,170
- Cubette Transport (Recycling Plant to City Light)	\$32,258
- Cubette Bunkers and Conveyors at City Light Plant	<u>\$18,550</u>
Total:	\$90,978

Operating Cost Per Ton UNPROCESSED Municipal Waste	\$1.94
--	--------

AMORTIZATION + INTEREST @ 5%

<u>Time Period</u>	<u>10 Year</u>	<u>15 Year</u>
- Cubette Preparation System	\$23,763	\$17,418
- Cubette Transportation System	\$12,320	\$9,017
- Cubette Bunkers and Conveyors	<u>\$25,641</u>	<u>\$18,794</u>
Total:	\$61,706	\$45,229

<u>Amortization Cost Per Ton UNPROCESSED Waste</u>	\$1.32	\$.97
--	--------	--------

TOTAL OWNING AND OPERATING ANNUAL COST

- Operating	\$90,978	\$90,978
- Owning	<u>\$61,706</u>	<u>\$45,229</u>
Total:	\$152,684	\$136,207

SUMMARY

- Cost Per Ton UNPROCESSED Muni Waste	\$3.26	\$2.91
- Cost Per Ton PROCESSED Municipal Waste	\$5.44	\$4.85
- Cost Per Ton COMBINED Unprocessed Industrial AND Municipal Waste @ 300 TPD or 78,000 Tons Per Year	\$2.11	\$1.75

FORT WAYNE PROGRAM - CUBETTS AS FUEL - C.A.F.

ESTIMATE SUMMARY

PHASE I-A

Existing Data Gathering, Review, Analyze, Confirm, Correlate and Summarize	\$ 25,000
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PHASE I-B

Conceptual Facilities and Evaluation Program Design	25,000
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PHASE I-C

Facilities Engineering
Construction Drawings and Specs
Equipment- and Plant Modifications and Additions

A. NRC - Plant Additions Three - Cubers, Surge Bins, Conveyors	183,500
B. CUBETTE TRANSPORT Three - Transfer Trailers - 75 cu. yd. One - Tandem Tractor	95,000
C. CUBETTE BUNKERS AND CONVEYORS Receiving - unloading station Conveyors to surge bunker to scales chute	198,000
D. AIR POLLUTION CONTROL One - Electrostatic Precipitator One - Tandem Set Multi-clones, including collecting dust pneumatic handling	357,500 236,500
E. BOILER MODIFICATIONS FOR TESTING Controls, Instrumentation, Telemetering, including recording equipment, sampling galleries, Tube metal corrosion, monitoring devices, thermocouples and recorders, overfire Air Turbulence systems, Access ports and openings for instruments and inspection, miscel. mechanical and electrical work	176,000
Engineering - Construction Program	124,650
Fort Wayne City Management	36,000
Legal, Adminis., Fiscal @ 2½%	34,300
Fringe Benefits @ 12½%	<u>4,500</u>
	\$1,445,950

FORT WAYNE PROGRAM - CUBETTS AS FUEL - C.A.F.
ESTIMATE SUMMARY (continued)

<u>PHASE I-D</u>	<u>EXISTING NATIONAL RECYCLING FACILITIES</u>	\$1,200,000
<u>PHASE II</u>	<u>OPERATION AND PERFORMANCE EVALUATION</u>	
IIa -	Steam Plant Operations	137,050
IIb -	Analyses: Fuels and Residues	88,500
	: Residue Weight Rates	38,500
IIc -	Flue Gas Sampling Program	315,480
IId -	Metal Wastage Investigation Program	45,000
IIe -	NRC Processing Plant Data Program	40,960
II f -	Maintenance during evaluation year	103,400
IIg -	Power and Fuel Oil during evaluation year	51,300
	Fort Wayne Management	36,000
	Fringe Benefits	<u>4,500</u>
		\$ 830,690

FORT WAYNE PROGRAM - CUBETTS AS FUEL - C.A.F.

PHASE ESTIMATE SUMMARY

PHASE I-A	\$ 25,000
PHASE I-B	25,000
PHASE I-C	1,445,950
PHASE I-D	1,200,000
PHASE II	<u>830,690</u>
TOTAL PROGRAM	\$ 3,526,640

PHASE I-C - Estimate For Equipment

- " A " -

NATIONAL RECYCLING PLANT --- ESTIMATE FOR EQUIPMENT ADDITIONS REQUIRED

Three John Deere Stationary Cubers

Modified Model #390 with 66 replaceable heat treated chrome dies, 150 HP electric motor with starter:	@ \$24,000	\$ 72,000
Foundations, wiring and piping:	@ \$ 3,000	\$ 9,000

Three Live Bottom Cuber Feed Bins

Deere Model 125 - 10 cubic yards - 6' X 15' weather-proof construction, electric drivers and starters:	@ \$ 5,200	\$ 15,600
Supporting steel and erection:	@ \$ 2,300	\$ 6,900

One Shredded Plastic Separation Device (NRC Specification)	\$ 5,000
--	----------

Pneumatic conveying system to bins including fans and drives, ducting, cyclones:	\$ 15,000
Foundations, wiring, installation:	\$ 5,000

Common Cubette Collecting and Delivering Belt Conveyor
(30' long) with bucket elevator (25' high) discharging
on transfer drag conveyor to Transfer Trailer loading
chutes:

Foundations, structural, wiring, installation:	\$ 3,000
--	----------

Cover shed over cubers, conveyors, trailer hatches	\$ 25,000
--	-----------

Bindicators, scales, recorders and miscellaneous instruments	<u>\$ 3,000</u>
--	-----------------

\$183,500

Installation costs includes: rigging, assembly, wiring, water
piping, structural supports and foundations

Phase II -

Maintenance during evaluation year on cubers, mechanical conveyors,
pneumatic conveyors, drives, electrical gear, scales, instruments,
recorders - materials and labor at 15%

\$ 24,000

PHASE I-C - Estimate For Equipment

- " B " -

CUBETTE TRANSPORT SYSTEM --- PROCESSING PLANT TO POWER PLANT

Three (3) Transfer Trailers - 75 cubic yard self-unloading,
compaction type with integral hydraulic power units and
power operated loading hatches @ \$24,000 \$ 72,000

One - Tandem Tractor International #COF4070A \$ 23,000

\$ 95,000

Projected Truck Mileage - 27,000 miles during evaluation year

Phase II -

Garage maintenance and repair of tractor and trailers for one
year operational period at 10% \$ 9,500

Preventive Maintenance of Tractor and Trailers: Greasing, oil
fills, cleaning and inspection of hydraulic system, power
system, tire inflation etc. to be performed by 2nd shift
driver each day.

PHASE I-C - Estimate For Equipment

- " C " -

MUNICIPAL POWER PLANT --- CUBETTE RECEIVING, STORAGE AND HANDLING

One - Covered Receiving - Storage Bunker	
12' wide X 40' long x 10' deep = 4,800 cubic feet	
- Reinforced heavy steel plate bunker set up 5' above grade	
to accommodate three 3' wide x 70' long apron/drag	
cubette retrieval conveyors located beneath	
- Bunker bottom - heavy steel grid bars with 10" square openings	
- Bunker provided with flared receiving lips - field constructed	\$ 58,000
One - Bunker Cubette Retrieval Conveyors	
- Three - 3' wide X 70' long apron pan conveyors with crickets	
spanning openings between #1 - #2 and #2 - #3, with corrugated weather covers - installed	\$ 52,500
One - Common Cubette Transfer Serpentix Conveyor	
20" wide X 90' long with baffle pockets and corrugated weather cover - installed	\$ 32,000
One - Cubette Feed Surge Control Bunker	
1/4 steel plate, 10 cubic yards capacity with bindicators - installed	\$ 5,000
One - Cubette Stoker Feed Conveyors	
one - 12" x 20' vari-speed screw	
one - 12" x 40' vari-speed screw	
in dust right, flat top troughs with supporting steel - installed	\$ 5,500
One - Combination Fuel Scales	
Two - Stock Equipment Company scales, modified for fuel mixing - installed	\$ 15,000
One - Bunker and Receiving Area Rain Shed - installed	\$ 20,000

Site Preparation:

Relocate concrete coal yard retaining wall - demolition and reconstruction. 12" - 24" X 10' high X 60' long reinforced concrete	\$ 10,000
	\$198,000

Phase II -

Maintenance during evaluation year on conveyors, drives, scales, electrical gear, meters - materials and labor at 10%	\$ 16,000
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PHASE I-C - Estimate For Equipment

- " D " -

MUNICIPAL ELECTRIC PLANT --- AIR POLLUTION CONTROL EQUIPMENTALTERNATE SYSTEMSSTUDY A - Single Hi-Efficiency Mechanical Collector

One - Multi-clone #6UP WHS-11-330	\$ 20,700
- (80,000 CFM, 425 °F, 3" wg PD)	
- Induced Fan - No. 600, Type RT 1200B	21,800
- (100,000 CFM, 425 °F, 15" wg SP 320 bhp)	
- Induced Fan Motor and Starter 350 Hp, 1200 RPM, 2300V, TEFC	14,900
- Transformer and Circuit Breaker	20,000
- Ductwork	4,100
- Stack Modifications and Rainshield	4,000
- Building Modifications	30,000
- Extend Pneumatic Ash Piping	15,000
- Miscellaneous Structural Steel and Field Labor	16,000
- Permanent Stack Sampling Station	4,500
	<u>\$151,000</u>

Phase II -

Maintenance for one year, including that for one collector, induced draft fan, motor drive, coupling, and transformer starter - materials and labor at 10%	\$9,700
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STUDY B AND C - Tandem Hi-Efficiency Mechanical Collectors
 (Second Unit on Boiler or Turbine Plant Roof)

Two - Multi-clone #6UP WHS-11-330	\$ 41,000
- (80,000 CFM, 425 °F, 3" wg PD)	
One - Induced Fan - No. 695, Type RT 1200B	29,000
- (100,000 CFM, 425 °F, 19" SP, 405 bhp)	
- Special Fan Housing Structure to Support Stack	3,500
- Induced Fan Motor and Starter - 450 Hp, 1200 RPM, 2300V, TEFC	18,000
- Transformer and Circuit Breaker	20,000
- Ductwork and Bracing	55,500
- Stack with Special Rainshield	12,500
- Building Modifications	35,000
- Extend Pneumatic Ash Piping	30,000
- Miscellaneous Structural Steel and Field Labor	16,000
- Permanent Stack Sampling Stations	9,000
	<u>\$236,500</u>

Phase II -

Maintenance for one year, including that for two collectors, induced draft fan, motor drive, coupling, and transformer starter - materials and labor at 10%	\$14,100
---	----------

PHASE I-C - Estimate For Equipment

- " E " -

MUNICIPAL ELECTRIC PLANT --- AIR POLLUTION CONTROL EQUIPMENTALTERNATE SYSTEMS - (Continued)STUDY D - Electrostatic Precipitator

One - Electrostatic Precipitator -	\$ 130,000
21 feet wide with two fields (delivered and erected)	
- Induced Fan - No. 595, Type RT 1200B	19,300
(100,000 CFM, 425 °F, 12" wg SP, 300 bhp)	
- Special Fan Housing Structure to Support Stack	3,500
- Induced Fan Motor and Starter - 300 Hp, 1200 RPM, 2300V, TEFC	19,200
- Transformer and Circuit Breaker	20,000
- Ductwork and Bracing (erected)	60,000
- Stack with Special Rainshield	12,500
- Building Modifications	40,000
- Extend Pneumatic Ash Piping	30,000
- Miscellaneous Structural Steel and Field Labor	16,000
- Permanent Flue Gas Sampling Stations	7,000
	<u>7,000</u>
	\$ 357,500

Phase II -

Maintenance for one year, including that for two collectors,
induced draft fan, motor drive, coupling, and transformer
starter - materials and labor at 10%

\$22,200

"ESTIMATES SHOWN FOR AIR POLLUTION CONTROL EQUIPMENT INSTALLATION
ARE ON A PER BOILER BASIS"

PHASE I-C - Estimate For Evaluation Program - Modifications and Equipment - " F " -

MUNICIPAL ELECTRIC PLANT --- BOILER MODIFICATIONS, ADDITIONS AND ADAPIONS
FOR EPA OPERATION - PERFORMANCE EVALUATION PROGRAM

One - Controls, monitoring, indicating, recording, telemetering instrumentation	\$ 76,000
- Miscellaneous electrical work	\$ 15,000
One - Tube Metal Thermocouples and Recorders (8 thermocouples)	\$ 15,000
One - Overfire Air Turbulence Systems	\$ 30,000
- Miscellaneous:	
Polish selected existing tubes, install several new tubes in strategic locations --- for erosion/corrosion monitoring	
Modify boiler baffles	
Install strategically located observation/access/instrument ports and doors	<u>\$ 40,000</u>
	\$176,000

Phase II -

Maintenance for one year, including those for controls, instruments and monitoring - materials and labor at 10%	\$ 17,600
---	-----------

PHASE II - Estimate For Performance Evaluation - (One Year)

- " IIa " -

MUNICIPAL ELECTRIC PLANT --- OPERATIONS

Operation of two (2) cubette fired boilers

* assume 50:50 ratio coal to cubettes

Fuel Handling - Fuel Burning - Residue Handling

Coal	-	1 shift	} 11 men
Cubettes	-	3 shifts	
Residue	-	3 shifts	

Eleven men for 2,200 hours per year @ \$4.00 per hour = \$96,800

*at 50:50 ratio coal to cubettes -- therefore, at $\frac{1}{2}$ time charged \$48,400

Boiler Operator/Data Logger (1/3 man per shift) \$10,000

Cubette Tractor Operator - also clean, adjust, monitor cubers
surge bind, receiving bunker and conveyors and responsible

for monitoring and maintenance of tractors and trailers - 6,300 M-H \$38,000

Supervision

Superintendent and Assistant @ $\frac{1}{2}$ time charged \$15,450

Field Testing Program Operation Manager \$10,000

Fringe Benefits @ 12 $\frac{1}{2}$ % \$15,200

Total: \$137,050

PHASE II - Estimate For Performance Evaluation - (One Year)

- " Iib " -

MUNICIPAL ELECTRIC FUELS LABORATORY --- ANALYSIS: FUELS AND RESIDUES

Have coal crusher/pulverizer - Add laboratory shredder \$ 6,000

DURING EACH DAY OF OPERATION CUBETTE SAMPLE PREPARATION AND ANALYSES

Proximate: M, VM, FC, A, BTU/lb., S, Cl, AST -°F Reducing

250 samples and analyses @ \$100 \$25,000

COAL ANALYSES

Proximate including S, Cl, AST

250 samples @ 1/2 cost of \$50 \$12,500

RESIDUE ANALYSES

Furnace Ash: Combustible, S, Cl, Composite AST -°F

250 samples and analyses @ \$50 \$12,500

Collector Flyash

250 samples and analyses @ \$50 \$12,500

Computer Tabulation, Correlation, and Evaluation of Separate and Composite Fuels/Residues:

- Cubette

- Coal

- Coal/Cubette Fuel

- Coal/Cubette Residue

\$20,000

\$88,500

DURING EACH DAY OF OPERATION

Residue weights to be obtained from all boiler unit collection hoppers

i.e. furnace ash hoppers, plenum-siftings hoppers, boiler hoppers

ECO-Air Heater hoppers and new air pollution control equipment hoppers.

40 days (8 weeks) two boilers - three men - 20 containers - 4 portable

scales - special protective clothing \$38,500

PHASE II - Estimate For Performance Evaluation - (One Year)

- " IIc " -

MUNICIPAL ELECTRIC PLANT --- FLUE GAS ANALYSES

ANALYSIS PROGRAM ELEMENTS

During the four six-week evaluation periods of selected coal: cubette ratios as well as the trials establishing steady state conditions just prior to initiation: --

CO₂ And O₂ Determination

Method: Continuous sampling and recording (Orsat check of recorder once each day)
Locations: Boiler Exit, Air Heater Exit

Smoke Detection

Method: Continuous indicator recorder with alarm
Location: Across Induced Fan inlet duct

Gas Temperature

Method: Recorder
Locations: Furnace Exit, Boiler Exit, Economizer Exit, Air Heater Exit

Air Temperatures

Method: Continuous Recorder
Locations: Air Heater - Inlet; Air Heater - Outlet

Usual Data Log Documentation

Method: Continuous Recorder
 ..Steam Flow, Air Flow, Steam Pressure,
 Steam Temperature, Feed Water Temperature
Log Entries: Coal Flow, Cubette Fuel Flow, Drafts

GAS SAMPLING AND ANALYSES PROGRAM

Steam Generator No. 1 - Electrostatic Precipitator

Location: Two Stations - Precipitator inlet and stack
Constituents: Dry Filterable Catch, Impinger Catch, SO₂,
 Chlorides, NO_x, Hydrocarbons, Particle Size Distribution

Steam Generator No. 2 - Tandem Mechanical Collectors

Location: Two Stations - No. 1 Collector outlet and stack
Constituents: Gas Sampling and Analyses similar to that for Steam Generator No. 1

PHASE II - Estimate For Performance Evaluation - (One Year)

- " IIc " -

MUNICIPAL ELECTRIC PLANT --- FLUE GAS ANALYSES - (Continued)GAS SAMPLING AND ANALYSIS EFFORT

Flue gas sampling at two locations on each steam generator; air heater outlet and precipitator outlet of one unit and #1 collector outlet and #2 collector outlet of second unit, while operating at four different composite coal: cubette fuel ratios as well as during preliminary steady state trials.

-Steady state trials	— 15 days
-Coal/cubette ratio - 3:1	— 10 days
-Coal/cubette ratio - 2:1	— 10 days
-Coal/cubette ratio - 1:1	— 10 days
and one other (1:2 or 1:3 or 0:1)	— 10 days
	55 days

Three-man Professional Sampling Team	165 M-D	
-Two Fort Wayne - Three-man Sampling Teams (Orientation and training program by Consultant)	240 M-H	
-Two three-man Fort Wayne teams at 165 M-D	13,200 M-H	
-Fort Wayne Sampling Teams	13,440 M-H	\$53,760
-Fringe Benefits @ 12½%		\$6,720
-Two complete O.A.P. approved sampling probes and trains, glassware and plastic containers and miscellaneous hardware as required for teams		\$30,000
-Consulting Engineer's Sampling and Analysis Program		\$180,000
-Mobile Field Analysis Laboratory		\$15,000
		\$285,480

PHASE II - Estimate For Performance Evaluation

- " IId " -

MUNICIPAL ELECTRIC PLANT --- GAS SIDE METAL WASTAGE

Determine the nature and magnitude of deposits on pressure parts (boiler tubes) and metal wastage potential by rigorous monitoring of the condition of at least six existing and new tubes to be strategically located in the steam generators. This program will be coordinated with the EPA Research Program on Metal Wastage, EPA-OR&M Contract EP00325-03A.

Participants:

..EPA-S.W.O. and EPA-OR&M
..EPA-OR&M Contractor
.."C.A.F." Project Consulting Engineer
..Fort Wayne Project Engineering

Orientation and Time Phase Program Development \$1,500

..EPA-OR&M and EPA-S.W.O.
..EPA-OR&M Contractor
.."C.A.F." Project Consulting Engineer
..Fort Wayne Project Engineering

Field Monitoring - two days - five occasions \$3,000
..EPA-OR&M Contractors

Coordination and Review Meetings \$1,500
..C.A.F. Project Consulting Engineer
..EPA-OR&M Contractor

Contractor Analyses of tube coupon specimens of deposits and metal wastage \$10,000
..EPA-OR&M Contractor

Analyses of tube segments removed from the selected old & new tubes \$5,000
..EPA-OR&M Contractor

- Tube segment specimens removed and replacement by Ft. Wayne Personnel \$6,000

Preparation of Laboratory Analyses - Explanatory Report \$4,000
..EPA-OR&M Contractor

Coordination, monitoring, and correlation of findings \$6,000
with the other aspects of the Performance Evaluation Program
with all data integrated into a Consolidated Project Report
..C.A.F. Project Consulting Engineer

Establishment and monitoring of scope and desired depth of this investigation

..EPA-S.W.O. and EPA-OR&M -- contingency \$5,000

Traveling and living expenses \$3,000

Total Estimate \$45,000

NATIONAL RECYCLING CORPORATION ---WASTE PROCESSING

Characterize Received Wastes and Process Flow Systems,
and Prepare Corresponding Process Material Balances

Characterize Municipal Waste Using BSWM Procedures

..Eight samplings coincident with each of the four phase cubette analyses,
burning, and gas sampling campaigns
..Eight X four X three man-days = 96 man-days

Characterize By-Product Streams

..Eight coincident samplings of four product streams
..Eight X two man-days = 16 man-days

Material Balances Monitor

..Input and Output material flow weight during evaluation
program (account for moisture change)
..Four campaigns each for ten days
..Forty X two men = 80 man-days

Trace Time/Life Cycle of a segment of rain waste
from receipt at National Recycling Corporation to
final residue in boiler - stoker ash hopper

..Four Trials @ eight man-days = 32 man-days

Fort Wayne Program Personnel	224 man-days	\$ 8,960
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Fort Wayne/National Recycling Program Coordinator	250 man-days	12,000
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C.A.F. Consulting Engineers, - preparation of analyses, correlations, summaries of characterizations, material balances, operating costs, revenues and system availability -		<u>20,000</u>
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TOTAL:		\$40,960
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PHASE II - Estimate For Performance Evaluation - (One Year)

- " IIf " -

MAINTENANCE SUMMARY ESTIMATE

Cubers, Surge Bins, Conveyors		\$ 24,000
Cuber Bunkers, Conveyors, Scales		16,000
Transfer Trailers and Tractor		9,500
Air Pollution Control Systems	Steam Generating Unit #1	22,200
	Steam Generating Unit #2	14,100
Testing - Evaluating Program Hardware		<u>17,600</u>
		\$103,400
@ 70% Labor	72,380	
@ 30% Material	31,020	

POWER AND FUEL SUMMARY

- " IIg " -

Cuber Preparation System	\$ 15,000
Cuber Bunker, Fuel Feed System	34,500
Fuel Oil for 30,000 miles	<u>1,800</u>
	\$ 51,300

CUBETTE FORMING MACHINES

To expediently determine the viability of forming fuel cubettes from the combustible residual fraction from the waste processing plant, a standard stationary farm type crop waste cuber was modified and adapted for the pilot operational trials. This type of extruder was equipped with 66 individually replaceable heat-treated, chrome-plated extruder dies. A small live bottom surge bin was installed, arranged to feed the cuber with conveyors to the bin and from the cuber to the transport container.

This low cost expeditious route was taken to keep the investment modest until the principle was proven, and any problem areas uncovered and resolved.

During the Phase Ia and Phase Ib portions of the Fort Wayne Program, still further investigations will be made of other extruder systems so that the most reliable, trouble-free units will be installed.

For the Fort Wayne Program outlined, we have included at this time the installation of three cubers so that we can reliably supply the quantity of cubettes for the evaluation program and still have the flexibility of determining the actual production limits (and corresponding power and maintenance requirements) of these machines.

Background And Feasibility Investigation

The principle of cubetting waste materials, which we have reintroduced with our program in Fort Wayne, is a very old art. It has been used for many years in compacting almost as many products as you can list. A report on the technical feasibility of "briquetting" shredded beneficiated municipal waste and its use as a fuel was presented at the "March 1959" Annual Spring Meeting of The Institute of Public Cleansing by F. L. Stirrup, Director of Public Cleansing, Salford, England.

In the early sixties, the U.S. paper industry was very interested in a machine being developed by Daffin Manufacturing Company for cubing scrap corrugated board. The paper industry was searching for a method for increasing the density of the scrap corrugated board and thereby decreasing the handling and transportation costs.

Sufficient interest was generated by the paper industries' Boxboard Research and Development Association in the Daffin development, which prompted them to retain Kinsey and Company to make a study of its potential. The conclusions of the study were very favorable, and a joint project between the Association and the manufacturer was undertaken at the General Paper Stock Company in St. Louis, Missouri.

During this period, DAFFIN had changed its name to FARMHAND, Inc. At about this time, trials were also being made at the JOHN DEERE plant in Ottumwa, Iowa, but it was concluded that the FARMHAND machine was better suited for the specified purpose. The results at St. Louis were very encouraging, but

CUBETTE FORMING MACHINESBackground And Feasibility Investigation (Continued)

FARMHAND's management became disillusioned when both Economy Baler Company and American Baler Company introduced their new high density balers (large bales). FARMHAND decided not to invest any additional money into the project and the cuber concept lay dormant for the next several years.

In early 1971, FARMHAND sold the rights to their cuber machine to a Japanese firm. They expressed intentions of developing the machine for cubetting paper stock, wood chips, shavings and other cellulosic waste products generated along the West Coast of the United States, for shipment to Japan.

Before committing to the final design of the National Recycling facility in Fort Wayne, a diesel powered portable cubetter was borrowed from JOHN DEERE. This unit was hand fed and several truck loads of cubettes were mixed with coal and burned in the Fort Wayne Municipal Electric Plant to establish this aspect of feasibility. The encouraging results prompted still further process investigation. Additional pilot cubetting trials were conducted in conjunction with the California Pellet Mill Company and Komarek-Graves. Both of these companies are prominent in this field.

From these various trials, it was generally concluded that the simpler, lower cost JOHN DEERE unit seemed to have the greatest potential, although it had relatively low thruput on shredded classified municipal waste. The FARMHAND machine would cost about four times as much to build, but would provide only twice the capacity. The JOHN DEERE unit also does not require a full-time operator.

The rated capacity of the JOHN DEERE cuber on uncleaned crop waste is 10 tons per hour. This is considered to be low for most types of processing. However, in view of the low initial cost, multiple units could be employed for higher productions.

Upon completion of the Fort Wayne National Recycling Plant (Spring 1971), cubettes were produced with the JOHN DEERE cuber continuously for 2 months. These were burned in the Fort Wayne Municipal Electric Plant, at the Container Corporation of America paper mill in Wabash, Indiana, and some tonnage was landfilled.

Based on the operational experience to date, the present cuber could be rated nominally at 5 tons per hour; its capacity depending principally on the feed constituents, moisture content, and feeding system employed.

Of course, a reasonably valid maintenance evaluation cannot be made without sufficient running time thru the different seasons processing waste with its changing character. However, from observation, 6 months of operating life is expected from each set of extrusion dies, and with contemplated modifications to the system, this may be extended to perhaps one year.

CUBETTE FORMING MACHINES

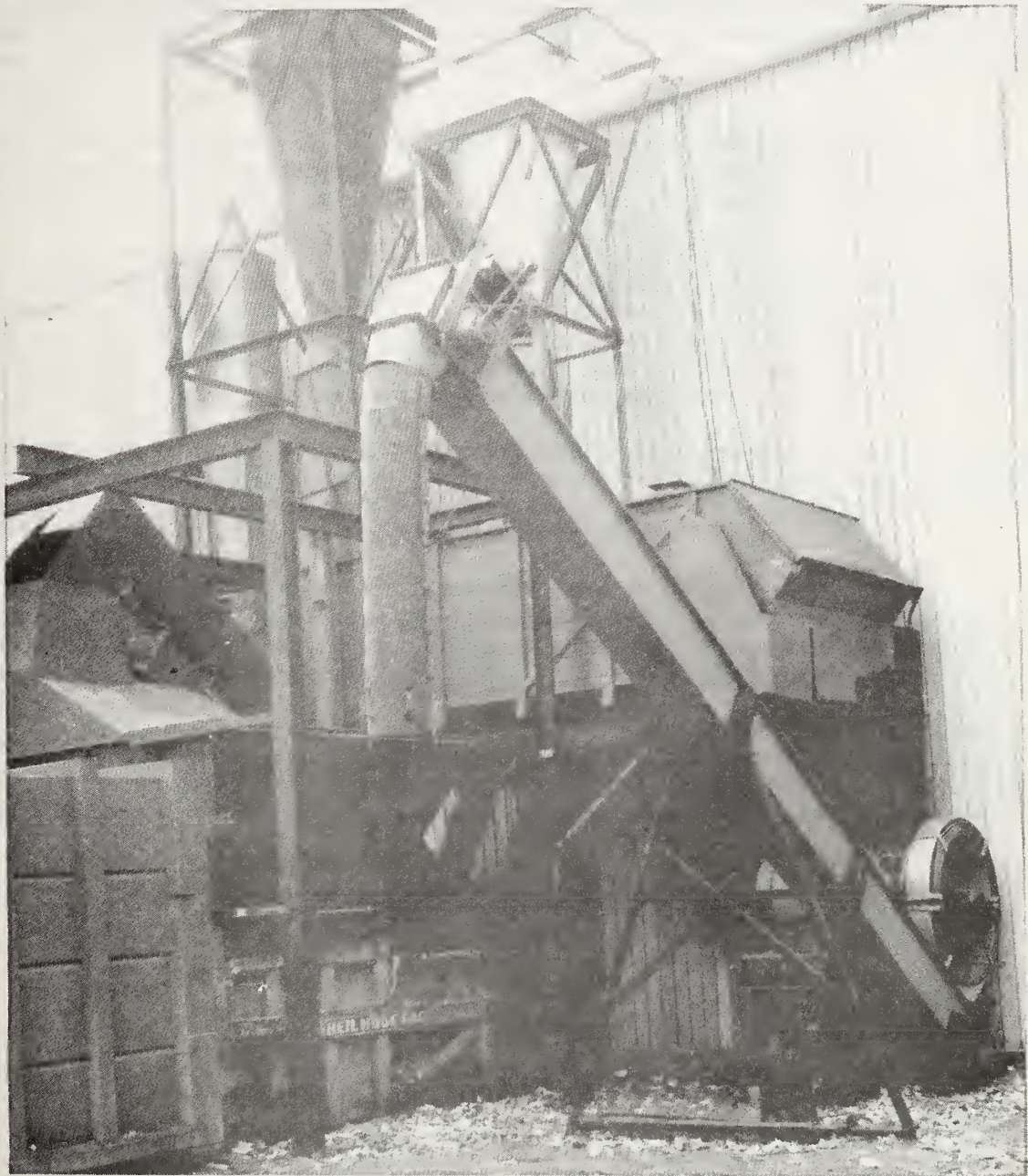
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CUBETTE EXTRUDER WITH TRANSPORT CONTAINER REMOVED

COMBUSTIBLE CHARACTER OF CUBETTES

In the Fort Wayne Power Plant fuel analysis laboratory, cubettes were analysed for BTU content during the early pilot runs in December, 1970.

A representative sampling of cubettes was drawn. The paper constituents (newsprint, periodicals, bread wrappers, etc.) in the cubettes was very apparent. It was not possible to reduce these samples in the laboratory coal pulverizer. Therefore, the cubette samples were suitably reduced with rasps to permit ASTM analysis.

Subsequent cubette analysis by Northern States Power Company laboratories on samples provided them corroborated the Fort Wayne findings. A summary of these analyses, as well as that of representative coals, is shown in the attached exhibit.

To further corroborate this data, in July, 1972, three one quart representative samples of cubettes were sent for analysis to Commercial Testing and Engineering Company of Chicago. This nationally known professional testing laboratory, using ASTM procedures, conducted the requested proximate and ultimate analyses, as well as determining standard 8 point fusion temperatures of the ash residue. Reproduced copies of the analyses of the three samples are attached.

Sampling from short pilot runs does not reflect the variation of fuel values that should be expected with seasonal changes, socio-economic backgrounds of collection areas, etc. For this reason, it is intended to draw at least 250 cubette flow samples for analysis during the grant evaluation year.

Incidentally the analysis data obtained from the pilot runs conducted in Fort Wayne coincidentally approach those values developed by F. L. Stirrup in his work briquetting shredded, sorted British mixed municipal refuse and reported at the 1960 annual Spring Meeting of The Institute of Public Cleansing.

The procedures and data generated to date have been most encouraging; however, for practical purposes, it is anticipated that the average cubette characteristics through the year will more nearly approach the following proximate analysis and should be considered as more realistic for projection and planning purposes.

Beneficiated Solid Waste Cubette Extrapolated Proximate Analysis

Moisture	%	15
Volatile Matter	%	65
Fixed Carbon	%	14
Ash	%	6
HHV - BTU/lb-af		6800
Sulfur	%	0.25
Chlorine	%	0.20
AST (reducing)	°F	2100

ANALYSES OF BENEFICIATED SOLID WASTE CUBETTES AND SELECTED COALS

<u>SAMPLE</u>	<u>CUBE WEIGHT</u> <u>GRAMS</u>	<u>MOISTURE</u> <u>PERCENT</u>	<u>ASH</u> <u>PERCENT</u>	<u>SULFUR</u> <u>PERCENT</u>	<u>CHLORINE</u> <u>PERCENT</u>	<u>HHV</u> <u>BTU/LB.</u>
1	19	7.39	3.82	0.38	0.16	7,397
2	9	7.72	1.68	0.29	0.21	7,202
3	17	7.55	2.43	0.25	0.20	7,166
4	11	7.32	3.00	0.17	0.24	7,092
5	10	7.29	2.71	0.21	0.17	7,093
AVERAGE		7.45	2.73	0.26	0.20	7,190

ILLINOIS COAL	11.83	10.62	3.17	0.40	10,984
LIGNITE COAL	35.38	6.60	0.54		7,067

Source: Northern States Power Company - Testing Laboratory 7-23-71

INDIANA (BRAZIL) COAL	10.54	9.52	4.32	----	11,646
KENTUCKY (SIMON) COAL	8.49	9.16	1.12	----	11,993
OHIO COAL	7.70	9.40	2.97	0.07	11,140
PENNSYLVANIA COAL	2.60	11.90	2.10	0.13	12,930

COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 • AREA CODE 312 728-8434



July 11, 1972

CITY UTILITIES
City-County Building
One Main Street
Fort Wayne, Indiana 46802

MAIL ADDRESS
16130 VAN DRUNEN ROAD
SOUTH HOLLAND, ILLINOIS
(CHICAGO) 60473
PHONE 312 264-1173

Sample identification
by

City Utilities

P. O. No. 6551

Salvage Waste Cubettes

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

J. O. Foster

Kind of sample
reported to us -----

IOF:scc



CHICAGO, ILLINOIS • CHARLESTON, W. VA. • CLARKSBURG, W. VA. • CLEVELAND, OHIO • NORFOLK, VA. • TERRE HAUTE, IND. • TOLEDO, OHIO • DENVER, COLORADO • BIRMINGHAM, ALABAMA • VANCOUVER, B.C.

	Sample #1		Sample #2		Sample #3	
Report No.	71-404265		71-404266		71-404267	
PROXIMATE ANALYSIS						
	<u>As Rec'd.</u>	<u>Dry</u>	<u>As Rec'd.</u>	<u>Dry</u>	<u>As Rec'd.</u>	<u>Dry</u>
% Moisture	5.21	--	6.68	--	8.00	--
% Ash	13.47	14.21	8.61	9.23	6.31	6.86
% Volatile	71.25	75.17	74.49	79.82	74.40	80.87
% Fixed Carbon	10.07	10.62	10.22	10.95	11.29	12.27
	100.00	100.00	100.00	100.00	100.00	100.00
B.T.U.	7125	7517	6787	7273	7170	7783
ULTIMATE ANALYSIS						
	<u>As Rec'd.</u>	<u>Dry</u>	<u>As Rec'd.</u>	<u>Dry</u>	<u>As Rec'd.</u>	<u>Dry</u>
% Moisture	5.21	--	6.68	--	8.00	--
% Carbon	41.98	44.29	40.15	43.02	39.42	42.85
% Hydrogen	5.81	6.13	5.45	5.84	5.36	5.83
% Nitrogen	0.07	0.07	0.05	0.05	0.05	0.05
% Chlorine	0.30	0.32	0.32	0.34	0.61	0.66
% Sulfur	0.09	0.10	0.14	0.15	0.08	0.09
% Ash	13.47	14.21	8.61	9.23	6.31	6.86
% Oxygen (diff)	33.07	34.88	33.60	41.37	40.17	43.66
	100.00	100.00	100.00	100.00	100.00	100.00

FUSION TEMPERATURE OF ASH

		<u>Reducing</u>	<u>Oxidzg.</u>	<u>Reducing</u>	<u>Oxidzg.</u>	<u>Reducing</u>	<u>Oxidzg.</u>
Initial Deformation	F.	1920	1960	1950	2100	1980	2000
Softening (H=W)	F.	2000	2100	2070	2200	2060	2120
Softening (H=1/2W)	F.	2020	2150	2120	2220	2080	2200
Fluid	F.	2080	2340	2200	2320	2220	2350

The Institute of Public Cleansing

ANNUAL SPRING MEETING, BLACKPOOL

19th and 20th March 1959

The Production of Briquetted Fuel and of Fertilisers from Refuse

By F. L. Stirrup, M.Inst.P.C.
Director of Public Cleansing, City of Salford

1. PREAMBLE

IN every branch of industry the elimination of waste and the utilisation of that which must necessarily be wasted in so far as a particular process is concerned are matters which receive a good deal of consideration.

In local authorities too, the prevention of waste must always be a matter of concern, but utilisation is something about which enthusiasm ebbs and flows in tune with the current market value. The department called upon to handle salvage or utilisation is logically the one which handles public cleansing because here are the raw materials which may be put to good use.

A local authority and its officers must of necessity consider first the statutory obligations placed upon them, secondly the most economical and efficient form of carrying out those obligations, and thirdly whether or not, in conducting these affairs, any revenue might be attracted with which operating costs may be to some degree offset.

In the conduct of salvage operations it is therefore incumbent upon the officer to see that no portion of their cost shall become a charge upon the rates, but rather that there shall be an excess of income over expenditure which may be used to counter the unavoidably high costs of operations from which no income can be derived. It follows, therefore, that except in times of national emergency, Councils will accept the advice of officers who consider their statutory work to be of paramount importance, to take the first opportunity to reduce or to cease salvage operations which no longer carry an attractive revenue, or are so bound about with regulations as to quality and quantity that far too much time has to be devoted to them to the detriment of other work.

Nevertheless it would be no true cleansing officer who would put such matters permanently into the background, he will always be looking for an opportunity to enter into the field of utilisation, but his one fear must be that

to the future and not be tied too rigidly to accepted methods of work. The exploration of this method has given me a zest for continued enquiry, for it started with a seemingly unworkable idea and progressed to what I believe to be a worth while achievement. I hope that like the true explorer I have taken no step without calculating the risk involved, and that unlike those adventurers of Conan Doyle who returned from "The Lost World", to present their evidence to the assembled scientists of the day, my "pterodactyl" will not fly away.

I must conclude by expressing my thanks to Mr. Bevan of Manchester for permitting his departmental chemist to hold discussion with me and for the use of one of his Separation Plants to prepare the sample load. In particular, however, I must thank the manufacturers and their British Agent for their courtesy and co-operation at every stage of the investigations, and my own Council for the time they have permitted me to devote to this project.

APPENDIX B

ANALYSIS OF BRIQUETTE PRODUCED FROM BRITISH REFUSE (Fine Dust, Metals and Whole Bottles and Jars extracted)

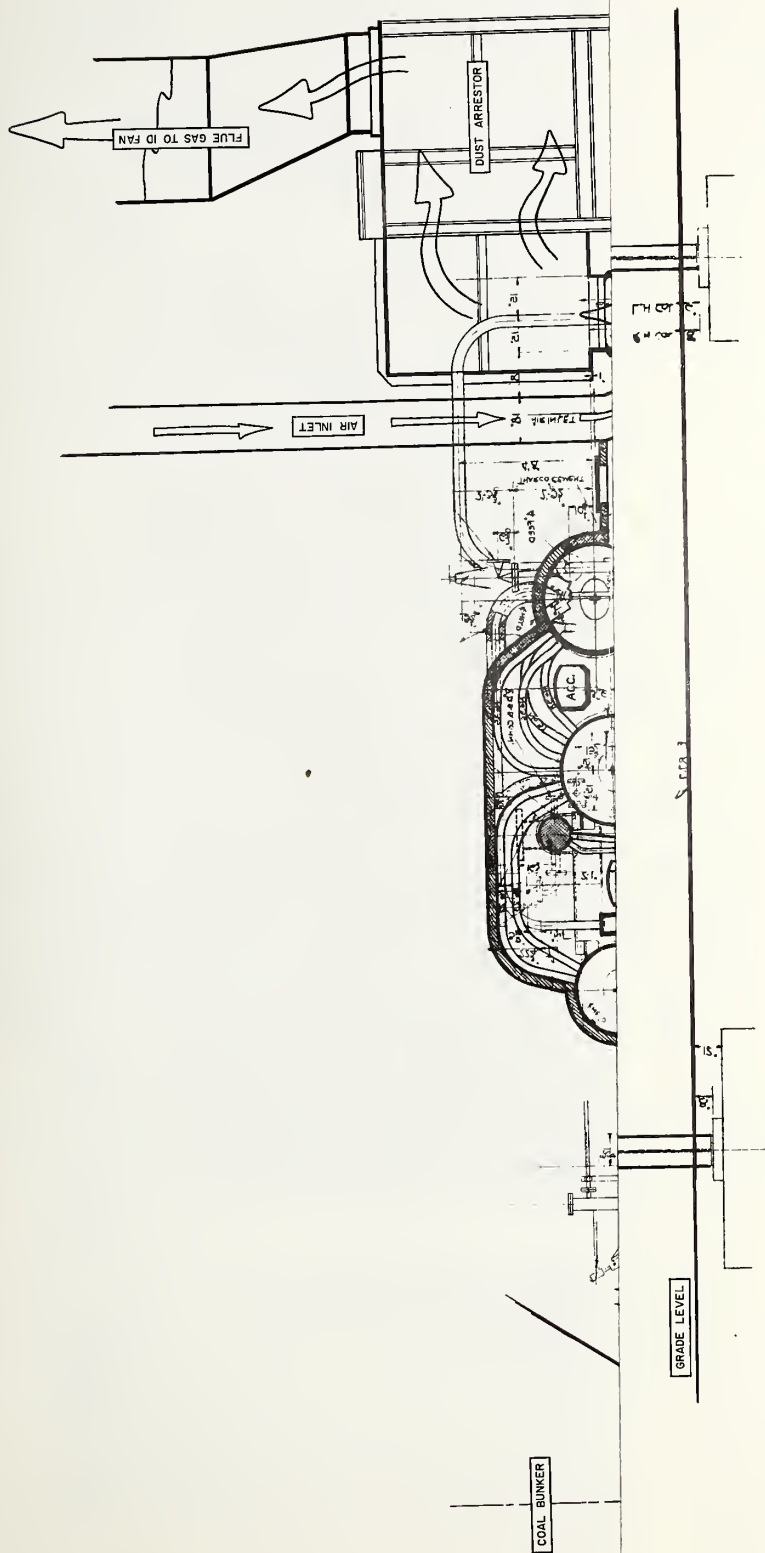
Detail	As Received	After Drying	Dried and Ash Removed
	Percentage	Percentage	Percentage
Moisture Content	5.6	—	—
Ash Content	25.2	26.7	—
Fixed Carbons	29.3	31.0	42.3
Volatile Material	39.9	42.3	57.7
	100.0	100.0	100.0
Maximum Calorific Value B.Th.U. per lb.	7,567	8,019	10,940
Minimum Calorific Value B.Th.U. per lb.	7,164	7,650	10,440

MERITS OF OLDER BOILER DESIGNS

Older design boilers with large water holding capacity and conservative heat transfer rates are prevalent in municipal plants throughout the midwest and are ideal for modification to the waste conversion concept.

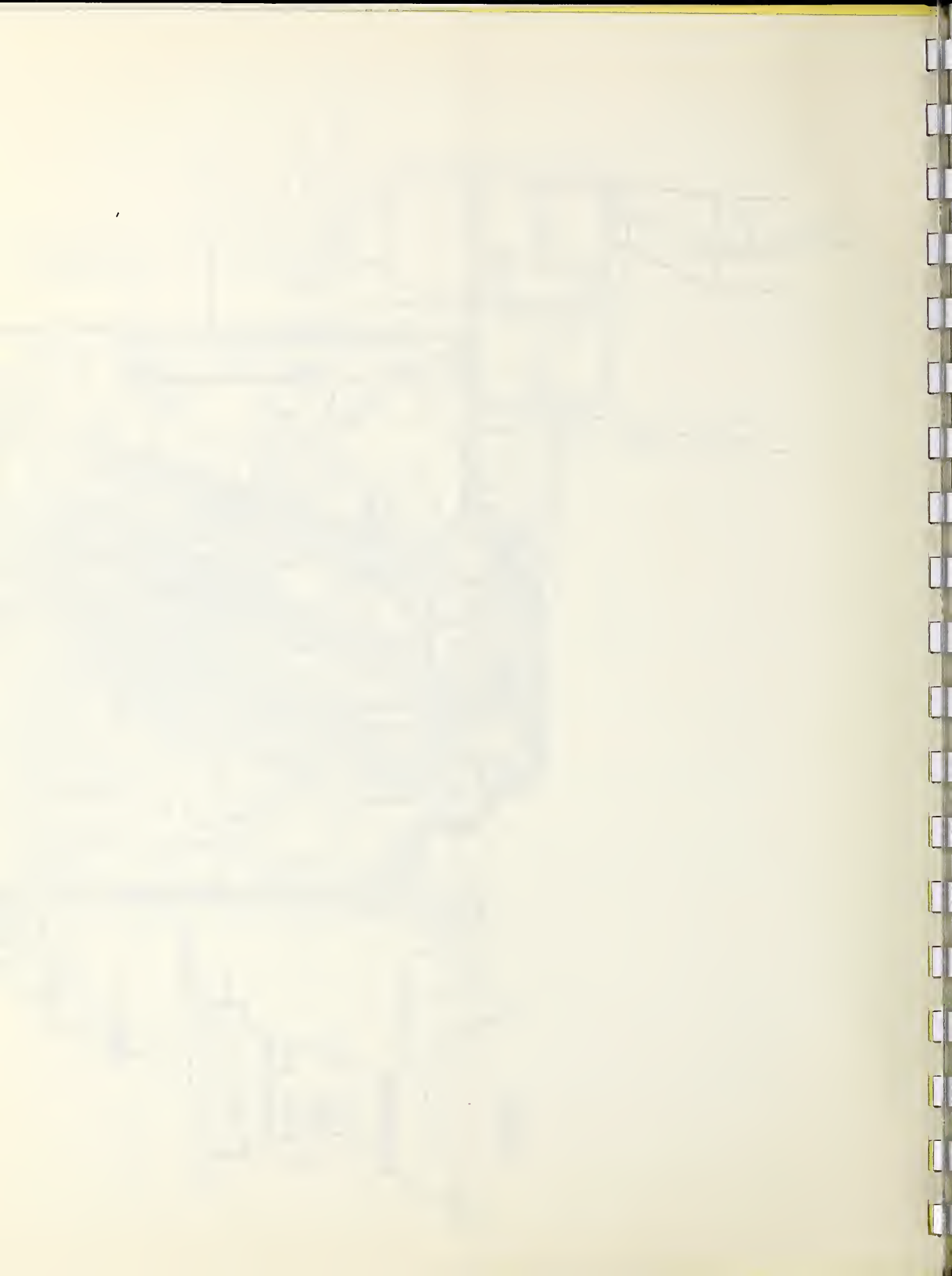
The steam generators in the Fort Wayne Municipal Light Plant are four drum Stirling type boilers and satisfy this criteria. The following tabulation outlines the pertinent attributes which make them especially suited for this demonstration:

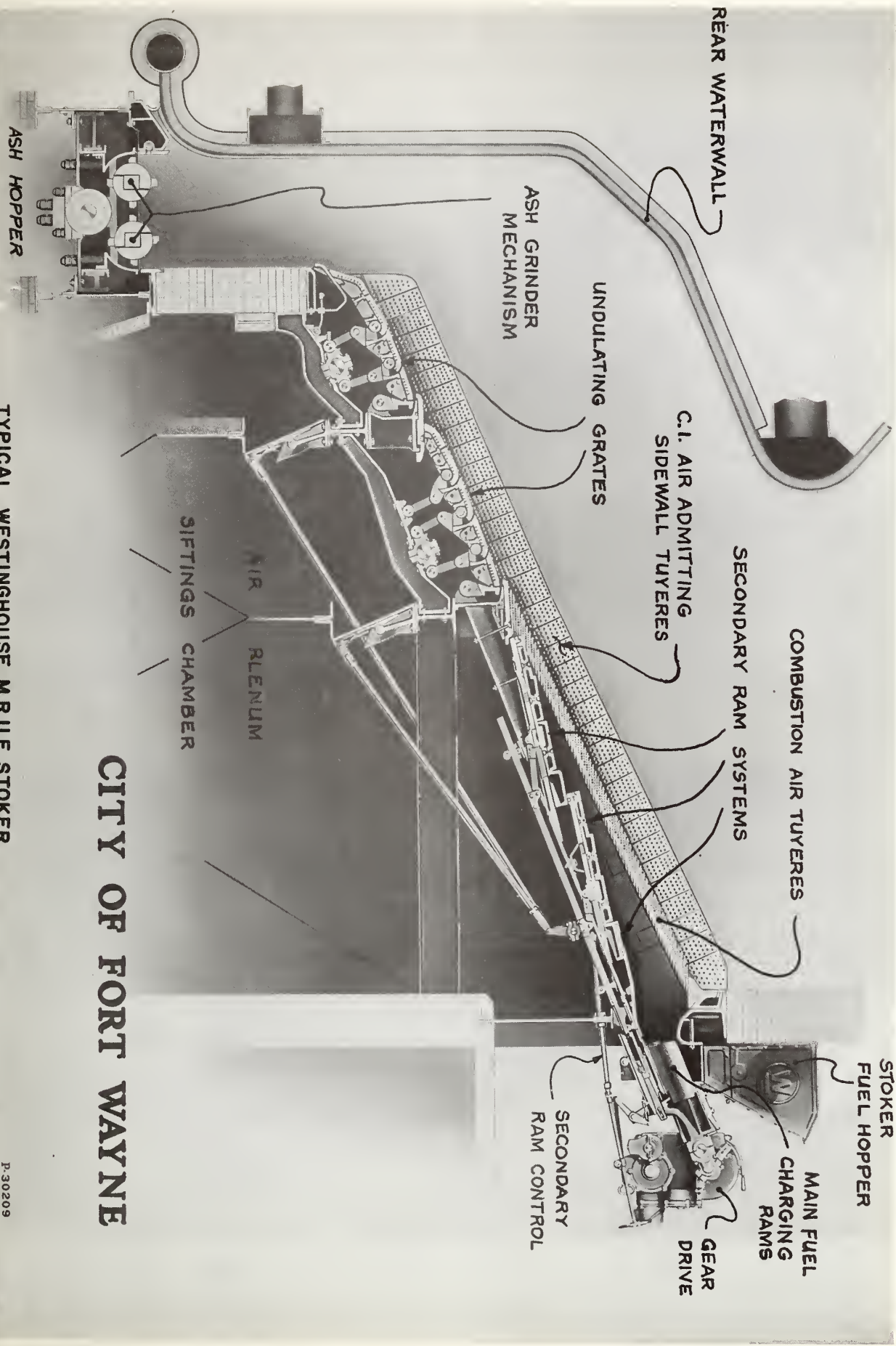
- Armored water wall tubes can provide the high absorption capability so desirable to contend with surges in energy released from burning cellulose waste fuels.
- Larger tube sizes throughout provide greater water holding capacity and circulation which avoids internal scale formations and resulting tube failures.
- Large tubes with no radical bends permit cleaning by mechanical means, avoiding the use of acid with its disposal problems.
- Wide tube spacing, providing more effective soot blowing, cleaning, inspection, tube replacement, welding of hangers and other maintenance. Wide lanes between tubes retards deposition and bridging by slag formation.
- Low gas velocities minimize particulate entrainment, decreasing impingement and abrasion of tube firesides in the gas flow.
- Convection type superheaters shielded from furnace radiation and screened from the impingement and softened slag forming ash by the deep bank (4 rows) of radiant screen tubes.
- Large furnace volume affording low gas stream velocities and adequate burning (furnace retention) time over the grates and therefore less carryover of small particles of burning fuel into the convection heat transfer zones.
- Large water holding capacity (3 large upper drums).
- Large open bays between tube banks to permit ready access for inspection, maintenance, tube removal and facilitating metal wastage investigation program contemplates polished areas.
- Large tubular type air heater of simple non-mechanical, low maintenance high availability design.



CITY OF FORT WAYNE MUNICIPAL ELECTRIC PLANT

STEAM GENERATING UNIT #5



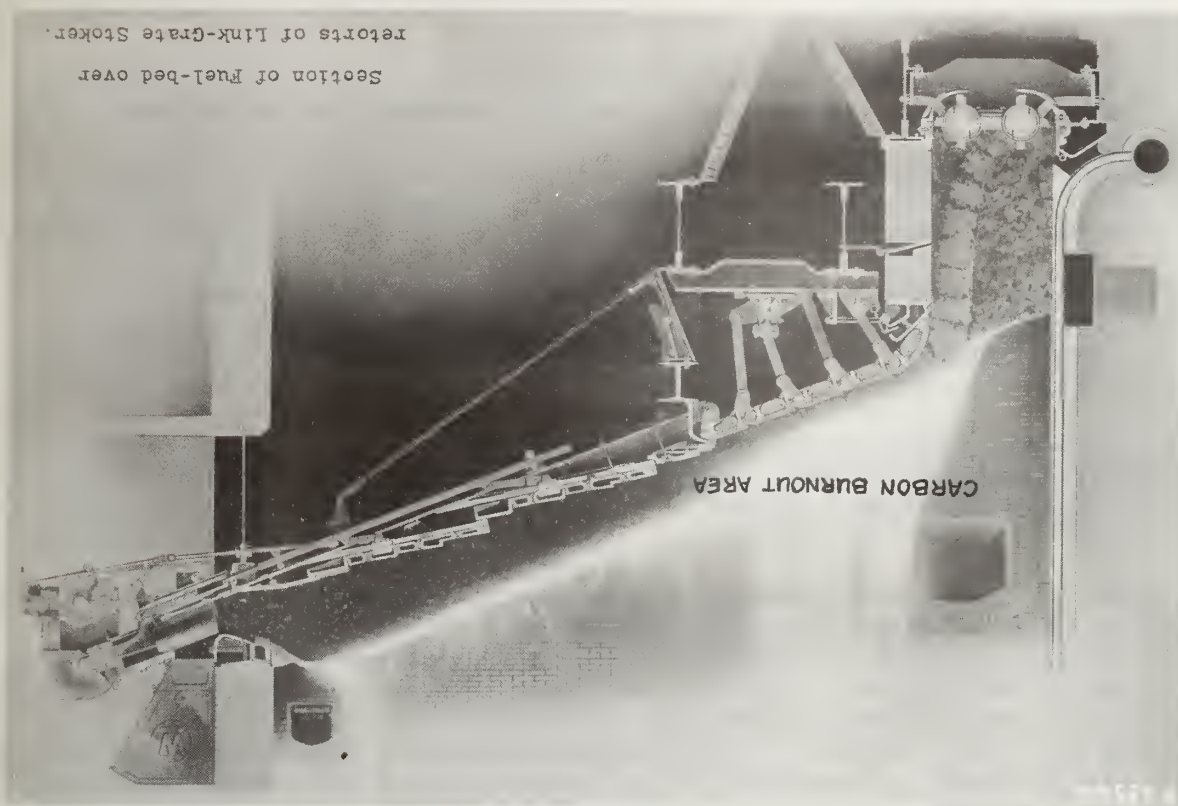


CITY OF FORT WAYNE

TYPICAL WESTINGHOUSE M.R.U.F. STOKER

P-30209





PRESSURE VESSEL INTEGRITY AND LICENSING

When boilers became commonplace and the first boiler casualty occurred, the public demanded regulatory legislation to guarantee the public safety.

To satisfy this growing need, the A.S.M.E. developed guidelines for boiler design fabrication and operation. These recommended guidelines were adopted and restated as rules and regulations by the early government agencies.

Casualty insurance companies entered this field from the time of early steam locomotives and soon inaugurated inspection services to maintain high standards of fabrication and operation, limit casualty claims and property damage, and loss of life.

State boiler and pressure vessel boards license the insurance companies and their inspectors after stringent examination for competence. The State boards utilize the insurance inspection reports to certify individual boilers and pressure vessels as safe for operation.

The Indiana law states that all boilers and pressure vessels must be inspected (both waterside and fireside) once each year and also at the time of any pressure vessel repair. Boilers meeting inspection standards are issued licenses certifying the vesselsafe to operate. If inspection determines that the boiler is unsafe to operate at design pressure, more extensive investigation is made. The investigation may include drilling of drums to determine metal thickness, etc. The extent of any metal wastage would dictate operation at a pressure to insure safety.

The attached reproductions of the Indiana Boiler and Pressure Vessel Certificates of Inspection, dated October 22, 1971 and November 24, 1971, indicate that the Fort Wayne boilers are certified for operation at the original design pressure.

The attached letter (dated July 6, 1972) discussing these boilers, was written by the district inspector of The Hartford Steam Boiler Inspection and Insurance Company. This Company has insured and inspected our equipment and boilers for many years.

STATE OF INDIANA
BOILER & PRESSURE VESSEL BOARD

CERTIFICATE OF INSPECTION

512 STATE OFFICE BUILDING
100 NORTH SENATE AVENUE
INDIANAPOLIS, INDIANA 46204

THIS CERTIFICATE MUST BE POSTED UNDER GLASS IN THE SAME ROOM AS THE VESSEL DESCRIBED.

INDIANA NO.

13624

FORT WAYNE CITY OF
308 E BERRY ST
FORT WAYNE IND

NAME OF OWNER OR USER



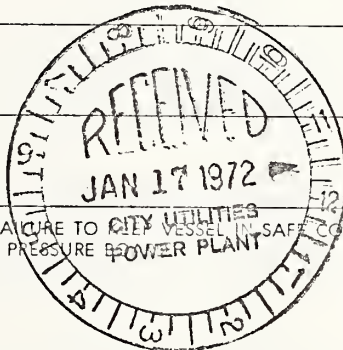
CERTIFICATE NO.

184284

THIS IS TO CERTIFY THAT THE VESSEL DESCRIBED BELOW MAY BE OPERATED AT A PRESSURE NOT TO EXCEED THAT SHOWN BELOW AND ONLY AT THE LOCATION SPECIFIED HEREIN

OWNER NUMBER	LOCATION OF VESSEL	MAXIMUM PRESSURE
00000005	N CLINTON ST	FT WAYNE
MAXIMUM PRESSURE	DESCRIPTION OF VESSEL	MANUFACTURER
TUBE	WATER TUBE	B & W
DATE INSPECTED	INSPECTION AGENCY	INSPECTED BY
11/24/71	HARTFORD	A K MATCHETT
		THIS CERTIFICATE EXPIRES 11/24/72

THIS CERTIFICATE MAY BE REVOKED FOR FAILURE TO KEEP VESSEL IN SAFE CONDITION. REPAIRS SHOULD NOT BE ATTEMPTED WITHOUT FIRST CONSULTING THE INDIANA BOILER & PRESSURE BOARD.



Robert L. Johnson

CHIEF INSPECTOR

INDIANA NO.

13619

FORT WAYNE CITY OF
308 E BERRY ST
FORT WAYNE IND

NAME OF OWNER OR USER



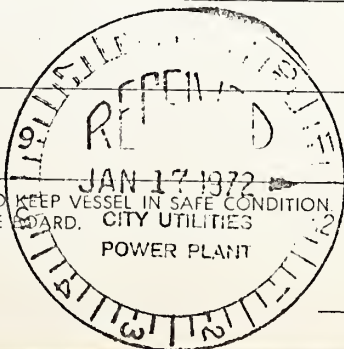
CERTIFICATE NO.

184282

THIS IS TO CERTIFY THAT THE VESSEL DESCRIBED BELOW MAY BE OPERATED AT A PRESSURE NOT TO EXCEED THAT SHOWN BELOW AND ONLY AT THE LOCATION SPECIFIED HEREIN

OWNER NUMBER	LOCATION OF VESSEL	MAXIMUM PRESSURE
00000004	LIGHT & POWER PLANT N CLINTON ST	FORT WAYNE
MAXIMUM PRESSURE	DESCRIPTION OF VESSEL	MANUFACTURER
TUBE	WATER TUBE BOILER	B & W
DATE INSPECTED	INSPECTION AGENCY	INSPECTED BY
10/22/71	HARTFORD	A K MATCHETT
		THIS CERTIFICATE EXPIRES 10/22/72

THIS CERTIFICATE MAY BE REVOKED FOR FAILURE TO KEEP VESSEL IN SAFE CONDITION. REPAIRS SHOULD NOT BE ATTEMPTED WITHOUT FIRST CONSULTING THE INDIANA BOILER & PRESSURE BOARD.



Robert L. Johnson

CHIEF INSPECTOR



THE HARTFORD STEAM BOILER
INSPECTION and INSURANCE COMPANY
16245 WEST SEVEN MILE RD., DETROIT, MICH. 48235

July 6, 1972

Mr. Newell F. Cunningham
Superintendent of Utilities
City of Fort Wayne
Municipal Light Plant
1902 North Clinton Street
Fort Wayne, Indiana 46802

Dear Newell:

As discussed, during my more than 15 years as an insurance inspector and 5 years as power plant engineer, I have seen and inspected boilers and pressure vessels of many, many types, designs and sizes.

Until some ten years ago, most boiler designs had generous sized tubes, wide tube spacing, low gas velocities, shielded superheaters, large furnace volumes, etc. These features were provided even for gas and oil-fired boilers.

The conservative design of boilers, such as your four drum Stirlings, is evidenced by the fact there are many such units operating some 40 years and longer, and are still in excellent condition, generating steam at the original design pressures and temperatures.

I am very familiar with all the equipment in your plant and its operating history, having been the insurance inspector these many years.

If you continue with your present operating and maintenance procedures, in my judgment, the City of Fort Wayne can anticipate many more years of reliable service from their steam generators.

If there is anything I can do to be of assistance, I am as close to you as a 'phone call.

Yours very truly,

A. Keith Matchett

A. Keith Matchett
District Inspector

AKM: ah

FUELS AND ENERGY NEEDS

The accompanying curves reflect the fuel availability and cost dilemmas being faced by the electric utilities and industry in general.

There are shortages or impending shortages in all fuels: natural gas, ecologically acceptable fuel oil and coal, and even nuclear fuels. The agonizing development (if ever) of the breeder reactor has focused attention on the limited reserves of mineable uranium, even with less than five decades of nuclear power production and use (much of this only on a very small scale). The cost of all fuels for power production is increasing geometrically with no end in sight, and with a very real question of sufficient fuel supply, even for the next few decades.

The unit cost of new generating facilities has accelerated markedly in recent years and the lead time from commitment to operation has also lengthened inordinately.

There is even now a shortage of installed electric generating capacity which precludes the usual phasing out of the older, smaller generating plants. These plants may be needed for some time to come.

These are all compelling reasons for searching for all practical methods to utilize the energy resources inherent in the wastes of the community. When properly prepared and formed into controlled quality cubettes, this low cost, low sulfur, locally generated beneficiated salvage fuel can be readily handled, stored and utilized in hundreds of existing steam generating plants. The practicality and potential benefits to be derived from this type of energy resources recovery from the community's wastes is the objective of this demonstration and evaluation project.

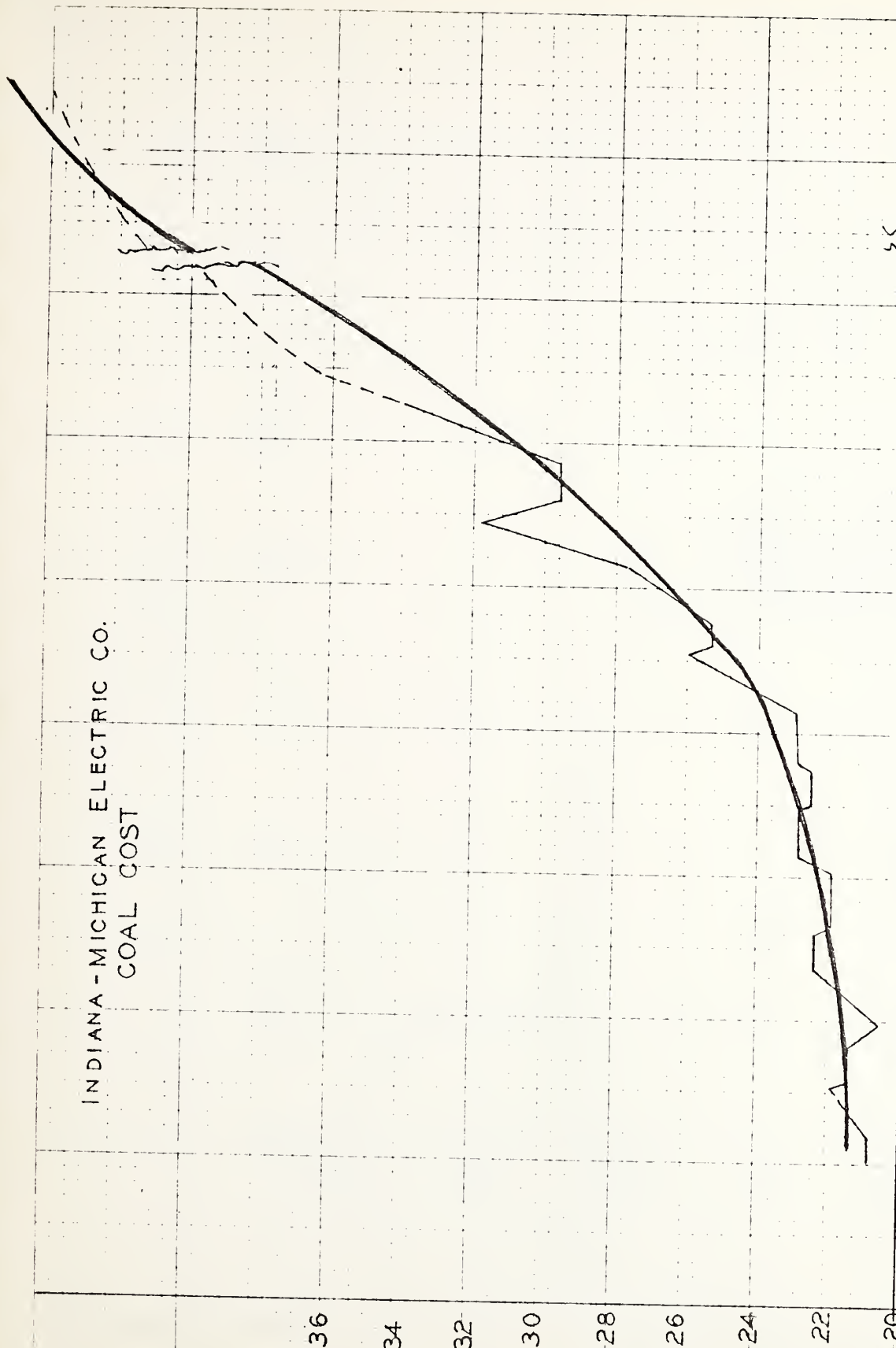
INDIANA-MICHIGAN ELECTRIC CO. COAL COST

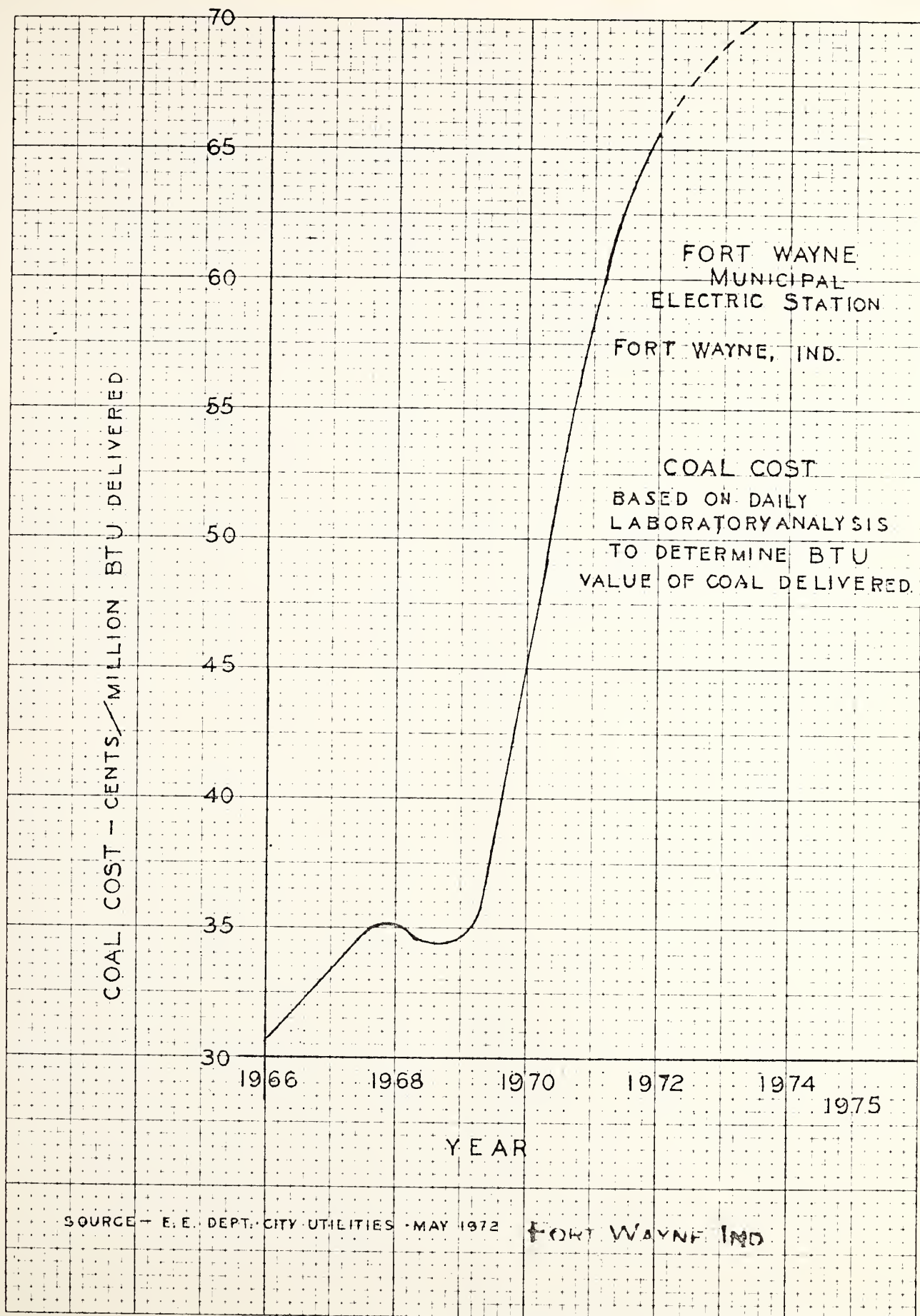
COAL COST \$/1,000,000 BTU

1967 1968 1969 1970 1971 1972 1973 1975

YEAR

SOURCE - E. E. DEPT. - CITY UTILITIES - MAY 1972 FORT WAYNE, IND.





GOVERNMENT STEAM GENERATING FACILITIES

POTENTIALLY SUITABLE FOR

BENEFICIATED SALVAGE FUEL CUBETTE FIRING

The attachment is a preliminary analysis of the potential applicability of this concept to government owned stoker-fired facilities.

Although even this listing is not complete, it is indicative of the broad application potential. There are, of course, several times as many installations in industry, and with greater steam generating capacity.

To permit practical utilization of fuel energy salvaged from the communities' wastes, in these many plants, the salvage fuel must be suitably prepared into "lump" form (approaching the coal size normally used), having adequate structural integrity to permit automated handling and term storage with reliable retrieval. In addition, the "lump" salvage fuel should be of controlled quality and substantially free of contaminants, such as metals, ceramics and dirt.

ROY F. WESTON

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

PRELIMINARY ANALYSIS SUMMARY

Boiler Plants With Stoker Equipment Potentially Suitable For Cubetted Salvage
Fuel Firing

	Number of Plants	Number of Units	Total Steam Generating Capacity
Municipal Steam-Electric Stations	86	113	10,834,000
Government Boiler Plants	131	247	14,609,500
TOTAL	217	380	25,443,500

RFW: 468-09A

January, 1972

H. Hollander



ROY F. WESTON, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS
LEWIS, LANE ■ WEST CHESTER ■ PENNSYLVANIA

4 January 1972

REPLY TO:
LEWIS LANE
WEST CHESTER
PENNSYLVANIA 19380
215-692-3030
TELEX NUMBER 83-5348
CABLE ADDRESS RFWINC

Dr. James G. Abert, Director of Research
National Center for Resource Recovery, Inc.
Suite 800, 1211 Connecticut Avenue, N. W.
Washington, D. C. 20036

Subject: BENEFICIATED SOLID WASTE CUBETTES AS SALVAGE FUEL FOR STEAM GENERATION

Dear Dr. Abert:

As requested by you and Bill Kellerer, we are enclosing a more formalized, consolidated listing of those municipal, governmental and institutional boiler plants with stoker equipment suitable for cubette salvage fuel firing.

We are compiling a similar listing of the installations at private utility stations, specific industries, as well as those with current capability of using cellulose refuse as fuel, separately or in combination with fossil fuels.

Although the enclosed listing is not complete, it is indicative of the broad potential for this application. Since there are so many more installations at "private" facilities, the potential for accommodation is far greater.

As mentioned in the material provided you previously, some renovation to existing equipment may be required. The addition of suitable air pollution control devices (where absent) and the installation of appropriate handling systems for controlled storage, feeding and distributing the combination fuels to the furnaces is to be expected.

The technical, operational and economic practicality of this concept could be most easily demonstrated in Fort Wayne where the materials processing facilities have been in operation for some time. The Community, their officials and those in the State House are receptive to having the municipal electric station rejuvenated and adapted to accommodate this locally generated by-product fuel for power, derived from the solid wastes of the Community.

ROY F. WESTON

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

Dr. James G. Abert

-2-

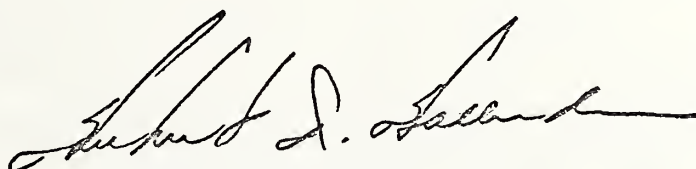
4 January 1972

In view of the beneficial impact which this concept could provide to many of the vexing problems encountered and anticipated, the recognized urgency for materials and energy resources conservation, it is hoped that this investigation program could be funded in the very near future.

We hope the enclosures will serve your needs for the present. As the other installation compilations are completed copies will be forwarded to you. In the interim, if additional information is desired or we can be helpful in any way, please do call.

I am looking forward to our next meeting and continuation of our stimulating discussions.

Very truly yours,



Herbert I. Hollander, P.E.
Principal Consultant

HIH:lp:DUPLICATE

Enclosures

cc: Mr. Fred S. Ehrman, Director
Fort Wayne Board of Public Works
(2 copies)

bcc: John DeFilippi
Jim McColl
Ron Lawson
Paul Woodruff
Jim Polich

Dick Eldredge
Bill Sitman
Jim Germain
Walt Hoover

BOILER PLANTS WITH STOKER EQUIPMENT SUITABLE
FOR CUBETTE SALVAGE REFUSE FUEL FIRING

Lists compiled are for:

- Municipal Steam - Electric Stations
- Government Boiler Plants
 - Federal
 - State
 - County
 - Municipal
 - Institutional

- NOTE:
- Lists compiled from information supplied by ONLY three (3)* of the seven (7) stoker equipment manufacturers.
(* Detroit Stoker Co., La Clede Stoker Co., Riley Company)
 - Information provided by manufacturers not complete. . .some installation tabulations did not go beyond 1953.
 - Lists compiled only include those installations made since 1940.
All known abandoned units were omitted.
 - Lists compiled only include those boiler units of 30,000 pph capacity and greater.
 - Lists to follow will be for:
 - Private (Investor Owned) Electric Utilities
 - Private (Investor Owned) Steam Heating Utilities
 - Industrial Steam Plants by Major Industries
 - Combination Cellulose Refuse and Fossil Fuel Plants
 - Type of Continuous Ash Discharge Stoker Equipment:
 - CG. . .Chain Grate (mass burning)
 - TG. . .Traveling Grate (mass burning)
 - MRUF. . .Multiple Retort Underfeed (mass burning)
 - SS. . .Spreader Stoker (semi-suspension burning)

MUNICIPAL STEAM ELECTRIC STATIONS
with stoker firing equipment

Plant	Number Boiler Units	Type Stoker Firing	Approximate Total Capacity Pounds Steam/Hour
Walsenburg, Colorado	1	CG	70,000
Breese, Illinois	2	CG	53,000
Carlyle, Illinois	1	CG	30,000
Fairfield, Illinois	1	CG	70,000
Highland, Illinois	2	CG	130,000
Washington, Indiana	2	CG	180,000
Macon, Missouri	1	CG	55,000
Sikeston, Missouri	1	CG	60,000
Bellefield, Pennsylvania	1	CG	100,000
Flora, Illinois	1	TG	70,000
Metropolis, Illinois	2	TG	75,000
Salem, Illinois	1	TG	37,000
Kendallville, Indiana	1	TG	90,000
Coldwater, Michigan	1	TG	100,000
Onondago, Syracuse, New York	3	TG	96,000
Anderson, Indiana	3	MRUF	240,000
Fort Wayne, Indiana	4	MRUF	250,000
Holland, Michigan	2	MRUF	80,000
Lansing, Michigan	2	MRUF	113,000
Traverse, Michigan	2	MRUF	139,000
Austin, Minnesota	1	MRUF	100,000
Hibbing, Minnesota	1	MRUF	52,000
Madison, Minnesota	1	MRUF	27,000
Greenwood, Mississippi	1	MRUF	168,000
Freemont, Nebraska	4	MRUF	246,000
Vineland, New Jersey	3	MRUF	232,000
Columbus, Ohio	1	MRUF	142,000
Dover, Ohio	2	MRUF	170,000
Hamilton, Ohio	2	MRUF	130,000
Painesville, Ohio	2	MRUF	225,000
Troy, Ohio	2	MRUF	130,000
Quakertown, Pennsylvania	2	MRUF	58,000
Alabama Co-op., Andalusia, Ala.	2	SS	180,000
Dover, Delaware	1	SS	85,000
Crawfordsville, Indiana	1	SS	125,000
Frankfort, Indiana	1	SS	125,000
Jasper, Indiana	2	SS	240,000
Portland, Indiana	1	SS	75,000
Ames, Iowa	1	SS	95,000

MUNICIPAL STEAM ELECTRIC STATIONS
with stoker firing equipment
(Continued)

Plant	Number Boiler Units	Type Stoker Firing	Approximate Total Capacity Pounds Steam/Hour
Cedar Falls, Iowa	1	SS	72,000
Corn Belt Co-op, Humboldt, Iowa	1	SS	125,000
Denison, Iowa	1	SS	45,000
Mount Pleasant, Iowa	2	SS	145,000
Muscatine, Iowa	3	SS	466,000
Pella, Iowa	1	SS	30,000
Sibley, Iowa	1	SS	60,000
Webster, Iowa	2	SS	70,000
Henderson, Kentucky	2	SS	140,000
Hagerstown, Maryland	2	SS	140,000
Coldwater, Michigan	1	SS	70,000
Gladstone, Michigan	2	SS	80,000
Kalamazoo, Michigan	1	SS	50,000
Richland Center, Michigan	1	SS	50,000
Wyandotte, Michigan	2	SS	230,000
Blue Earth, Minnesota	1	SS	50,000
Detroit Lakes, Minnesota	1	SS	70,000
Fairmont, Minnesota	1	SS	80,000
Moorhead, Minnesota	3	SS	360,000
New Ulm, Minnesota	1	SS	100,000
Rochester, Minnesota	2	SS	180,000
Sleepy Eye, Minnesota	1	SS	48,000
Springfield, Minnesota	1	SS	35,000
Virginia, Minnesota	3	SS	225,000
Willmar, Minnesota	2	SS	295,000
Greenwood, Mississippi	1	SS	120,000
Chillicothe, Missouri	1	SS	75,000
Hannibal, Missouri	1	SS	90,000
Hastings, Nebraska	1	SS	80,000
Vineland, New Jersey	2	SS	230,000
Gallup, New Mexico	1	SS	60,000
Minnkota Co-op., Grand Forks, ND	3	SS	277,000
Columbus, Ohio	1	SS	150,000
Miamisburg, Ohio	1	SS	48,000
Montpelier, Ohio	1	SS	40,000
Napoleon, Ohio	2	SS	200,000
Orville, Ohio	1	SS	75,000
Painesville, Ohio	2	SS	400,000
Reading, Ohio	3	SS	200,000
Troy, Ohio	1	SS	150,000
Eugene Board, Oregon	1	SS	175,000

MUNICIPAL STEAM ELECTRIC STATIONS
with stoker firing equipment
(Continued)

Plant	Number Boiler Units	Type Stoker Firing	Approximate Total Capacity Pounds Steam/Hour
Brookings, South Dakota	1	SS	45,000
Provo, Utah	1	SS	100,000
Washington Pwr., Spokane, Wash.	1	SS	80,000
Manitowoe, Wisconsin	1	SS	175,000
Marshfield, Wisconsin	1	SS	75,000
Menasha, Wisconsin	1	SS	130,000

(Incomplete - Listing only from 1940 through 1953)

GOVERNMENT BOILER PLANT INSTALLATIONS
(Federal, State, County, Municipal, Institutional)

Plant	Number Units	Type Firing	Total Capacity Pounds Steam/Hour
Elgin State Hospital Elgin, Illinois	2	CG	80,000
Kankakee State Hospital Kankakee, Illinois	4	CG	195,000
Manteno State Hospital Manteno, Illinois	2	CG	70,000
Southern Illinois University Carbondale, Illinois	3	CG	99,000
Illinois State Capitol Group Springfield, Illinois	2	CG	110,000
Southeast Missouri State College Cape Girardeau, Missouri	1	CG	30,000
Dixon State Hospital Dixon, Illinois	1	CG	45,000
State Hospital No. 3 Nevada, Missouri	1	CG	37,000
Peoria State Hospital Peoria, Illinois	3	CG	120,000

GOVERNMENT BOILER PLANT INSTALLATIONS
(Federal, State, County, Municipal, Institutional)
(Continued)

Plant	Number Units	Type Firing	Total Capacity Pounds Steam/Hour
Illinois Soldiers and Sailors Home, Quincy, Illinois	3	CG	150,000
State Training School for Girls Geneva, Illinois	1	CG	35,000
Western Illinois State Teachers College, Macomb, Illinois	1	CG	30,000
Lincoln State School and Colony Lincoln, Illinois	3	CG	130,000
Illinois State Capitol Group Springfield, Illinois	1	CG	55,000
Illinois State Penitentiary Pontiac, Illinois	3	CG	90,000
Chicago State Hospital Chicago, Illinois	1	CG	65,000
Indiana State Teachers College Terre Haute, Indiana	2	CG	90,000
Alton State Hospital Alton, Illinois	2	CG	100,000
Ohio State Reformatory Mansfield, Ohio	1	CG	50,000
Illinois State Penitentiary Menard, Illinois	1	CG	33,000
Columbus State Hospital Columbus, Ohio	3	CG	145,000
Scott Air Force Base Belleville, Illinois	1	CG	33,500
Kinross Air Force Auxiliary Kinross, Michigan	2	CG	70,000
Iowa State College Ames, Iowa	1	CG	100,000
Southeast Missouri State College, Cape Girardeau, Missouri	1	CG	20,000

GOVERNMENT BOILER PLANT INSTALLATIONS
(Federal, State, County, Municipal, Institutional)
(Continued)

Plant	Number Units	Type Firing	Total Capacity Pounds Steam/Hour
Wilkins Air Force Depot Shelby, Ohio	2	CG	140,000
Missouri State School Marshall, Missouri	1	CG	33,000
Military Personnel Records Center, Overland, Missouri	3	CG	94,000
Mental Health Institute Independence, Iowa	1	CG	35,000
New Trier Twnp. High School Winnetka, Illinois	1	CG	45,000
Garfield Park Chicago Park District Chicago, Illinois	1	CG	33,000
University of Missouri Columbia, Missouri	2	CG	150,000
St. Louis Ordinance Plant St. Louis, Missouri	2	CG	120,000
U. S. Atomic Energy Comm. Weldon Springs, Missouri	3	CG	240,000
Logansport State Hospital Logansport, Indiana	1	CG	45,000
Iowa State Reformatory Anamosa, Iowa	1	CG	30,000
Western Ky. State Teachers College, Bowling Green, Ky.	1	CG	48,000
Richmond State Hospital Richmond, Indiana	3	CG	93,000
University of Missouri Rolla, Missouri	1	CG	35,000
Northeast Missouri State Teachers College, Kirksville, Missouri	2	CG	70,000
Central State Hospital Indianapolis, Indiana	1	CG	50,000

GOVERNMENT BOILER PLANT INSTALLATIONS
(Federal, State, County, Municipal, Institutional)
(Continued)

Plant	Number Units	Type Firing	Total Capacity Pounds Steam/Hour
Eastern Illinois University Charleston, Illinois	1	CG	45,000
Dixon State School Dixon, Illinois	1	CG	72,000
School of the Ozarks, The Point Lookout, Missouri	2	CG	54,000
Dayton State Hospital Dayton, Ohio	1	CG	60,000
Western Kentucky State College Bowling Green, Kentucky	1	CG	35,000
Kinross Air Force Base Kinross, Michigan	1	CG	35,000
Veterans Adm. Hospital Brecksville, Ohio	2	CG	70,000
Ohio Soldiers' and Sailors' Orphans Home, Xenia, Ohio	2	CG	60,000
Kincheloe Air Force Base Kinross, Michigan	1	CG	35,000
State Hospital No. 3 Nevada, Missouri	1	CG	50,000
Kent State University Kent, Ohio	1	CG	40,000
Elgin State Hospital Elgin, Illinois	2	CG	90,000
Chanute Air Force Base Rantoul, Illinois	3	CG	240,000
Indiana State Reformatory Pendleton, Indiana	2	CG	120,000
Apple Creek State Hospital Apple Creek, Ohio	1	CG	65,000
Indiana State Teachers College Terre Haute, Indiana	1	CG	60,000
Veterans Adm. Center Dayton, Ohio	2	CG	80,000

GOVERNMENT BOILER PLANT INSTALLATIONS
(Federal, State, County, Municipal, Institutional)
(Continued)

Plant	Number Units	Type Firing	Total Capacity Pounds Steam/Hour
Southern Illinois University Carbondale, Illinois	2	CG	160,000
Eastern Illinois University Charleston, Illinois	1	CG	55,000
University of Missouri School of Mines and Metallurgy, Rolla, Missouri	1	CG	50,000
Saint Joseph's College Rensselaer, Indiana	1	CG	35,000
Boys Industrial School Lancaster, Ohio	1	CG	60,000
Western Ky. State College Bowling Green, Kentucky	1	CG	52,000
Logansport State Hospital Logansport, Indiana	1	CG	50,000
Kent State University Kent, Ohio	1	CG	80,000
Southeast Missouri State College, Cape Girardeau, Missouri	1	CG	55,000
Indiana State Soldiers' Home Lafayette, Indiana	1	CG	35,000
Chicago State Hospital Dunning, Illinois	3	CG	210,000
Ohio Penitentiary Columbus, Ohio	1	CG	100,000
Chanute Air Force Base Rantoul, Illinois	2	CG	60,000
Southern Illinois University Carbondale, Illinois	2	CG	160,000
Bowling Green State Univ. Bowling Green, Ohio	1	CG	100,000
Dixon State School Dixon, Illinois	1	CG	80,000

GOVERNMENT BOILER PLANT INSTALLATIONS
(Federal, State, County, Municipal, Institutional)
(Continued)

Plant	Number Units	Type Firing	Total Capacity Pounds Steam/Hour
Carnegie Institute of Technology Pittsburgh, Pennsylvania	1	CG	55,000
Illinois State Penitentiary Joliet, Illinois	1	CG	80,000
Indiana State School for the Deaf, Indianapolis, Ind.	1	CG	40,000
Central State Hospital Indianapolis, Indiana	1	CG	50,000
Madison State Hospital Madison, Indiana	1	CG	50,000
Illinois State Penitentiary Joliet, Illinois	1	CG	80,000
Jacksonville State Hospital Jacksonville, Illinois	1	CG	45,000
Muscatatuck State Hospital Butlerville, Indiana	1	CG	60,000
Indiana State Reformatory Pendleton, Indiana	1	CG	75,000
University of Louisville Medical Center, Louisville, Kentucky	2	CG	150,000
Madison State Hospital Madison, Indiana	1	CG	50,000
Indiana State Prison Michigan City, Indiana	3	CG	90,000
Illinois State Penitentiary Vienna, Illinois	2	CG	100,000
Purdue University Lafayette, Indiana	1	TG	110,000
Iowa State College Ames, Iowa	2	TG	205,000
Iowa State University Ames, Iowa	2	TG	250,000
Cornell University Ithaca, New York	1	TG	190,000

GOVERNMENT BOILER PLANT INSTALLATIONS
(Federal, State, County, Municipal, Institutional)
(Continued)

Plant	Number Units	Type Firing	Total Capacity Pounds Steam/Hour
Columbus State School Columbus, Ohio	1	TG	40,000
College of Wooster Wooster, Ohio	1	TG	40,000
Medical Center Cleveland, Ohio	8	TG	386,000
State Boys Industrial School Lancaster, Ohio	1	TG	37,000
Toledo State Hospital Toledo, Ohio	3	TG	180,000
Wilkins Air Force Base Shelby, Ohio	1	TG	70,000
Lafayette College Easton, Pennsylvania	1	TG	43,000
USN Supply Depot Philadelphia, Pennsylvania	2	TG	112,000
Pa. State Correctional Institute Cumberland, Pennsylvania	1	TG	70,000
Vanderbilt University Nashville, Tennessee	2	TG	160,000
Wisconsin State Hospital Mendota, Wisconsin	3	TG	160,000
Virginia Polytechnic Institute Blacksburg, Virginia	1	TG	90,000
Cincinnati General Hospital Cincinnati, Ohio	2	MRUF	70,000
Kirtland Pumping Station Cleveland, Ohio	4	MRUF	160,000
Detroit-Maybury Sanitorium Northville, Michigan	1	MRUF	50,000
Detroit-Shrenk Steam Plant Detroit, Michigan	4	MRUF	120,000
Department of Public Works Holland, Michigan	2	MRUF	130,000

GOVERNMENT BOILER PLANT INSTALLATIONS
(Federal, State, County, Municipal, Institutional)
(Continued)

Plant	Number Units	Type Firing	Total Capacity Pounds Steam/Hour
NYS - Letchnorth Village Thiells, New York	5	MRUF	180,000
Baltimore City Hospital Baltimore, Maryland	3	MRUF	90,000
Philadelphia Suburban Water Pickering Creek Plant, Phoenixville, Pennsylvania	1	MRUF	40,000
Colorado State Hospital Pueblo, Colorado	2	SS	180,000
Mt. Home Air Force Base Mt. Home, Idaho	1	SS	80,000
U. S. Naval Base Brunswick, Maine	2	SS	150,000
Limestone Air Force Base Limestone, Maine	4	SS	260,000
Loring Air Force Base Limestone, Maine	2	SS	130,000
La Peer State Training School La Peer, Michigan	1	SS	60,000
University of Minnesota Deluth, Minnesota	4	SS	120,000
University of Minnesota Minneapolis, Minnesota	2	SS	175,000
Medium Security Prisons Moberly, Minnesota	2	SS	120,000
University of Missouri Columbia, Missouri	1	SS	125,000
Kings Park State Hospital Kings Park, New York	4	SS	320,000
Grand Forks Air Force Base Grand Forks, North Dakota	2	SS	100,000
Cincinnati General Hospital Cincinnati, Ohio	2	SS	135,000
Columbus General Depot Columbus, Ohio	6	SS	420,000

GOVERNMENT BOILER PLANT INSTALLATIONS
(Federal, State, County, Municipal, Institutional)
(Continued)

Plant	Number Units	Type Firing	Total Capacity Pounds Steam/Hour
AEC - Fernald, Ohio	4	SS	300,000
AEC - Savannah River Dunbarton, South Carolina	10	SS	1,240,000
AEC - Richland, Washington	3	SS	240,000
Clemson Agriculture College Clemson, South Carolina	2	SS	150,000
University of Tennessee Knoxville, Tennessee	3	SS	300,000
Purdue University Lafayette, Indiana	2	SS	300,000

(This list is only representative. . . is incomplete)

AGREEMENT

This Agreement made this _____ day of July, 1972, by and between the Board of Public Works of the City of Fort Wayne, hereinafter referred to as "City" and the National Recycling Corporation, 5225 Old Maumee Road, Fort Wayne, Indiana, an Indiana Corporation, hereinafter referred to as "NRC".

WHEREAS, NRC is a company engaged in the business of recycling solid waste and,

WHEREAS, NRC has invested in excess of \$1,200,000 into their present facilities on Old Maumee Road and can process daily 300 tons of mixed municipal solid waste, as well as 200 tons of industrial solid waste and

WHEREAS, in NRC's materials recycling process they have remaining a residue which is primarily paper, plastic and wood, which is presently disposed of in a sanitary landfill and,

WHEREAS, the City of Fort Wayne owns and operates three utilities, one of which is the Electric Utility, and

WHEREAS, part of the Electric Utility consists of a Power Plant containing five boilers, four being MRUF coal stoker fired and said Power Plant also contains three steam turbine generators with a total name plate capacity of 40,000 KW/hr. and

- 2 -

WHEREAS, the residue from the NRC recycling process plant can and has, on a pilot basis, been compressed into "Cubettes" and used as a supplementary fuel at the Fort Wayne Municipal Power Plant, and

WHEREAS, the City of Fort Wayne is interested in obtaining a locally derived low sulfur, low cost fuel which would reduce costs of the Power Plant and also improve the environmental characteristics of the operation thereof, and

WHEREAS, there exists in Allen County a growing shortage of suitable and adequate sanitary landfills necessary to handle the approximate total of 600 tons of solid waste generated in the County each day, and

WHEREAS, the Three Rivers Coordinating Council is studying solutions to the ever-growing environmental problems, including air pollution, water pollution, solid waste disposal and land use,

NOW THEREFORE, the City and NRC, for the considerations hereinafter named agree as follows:

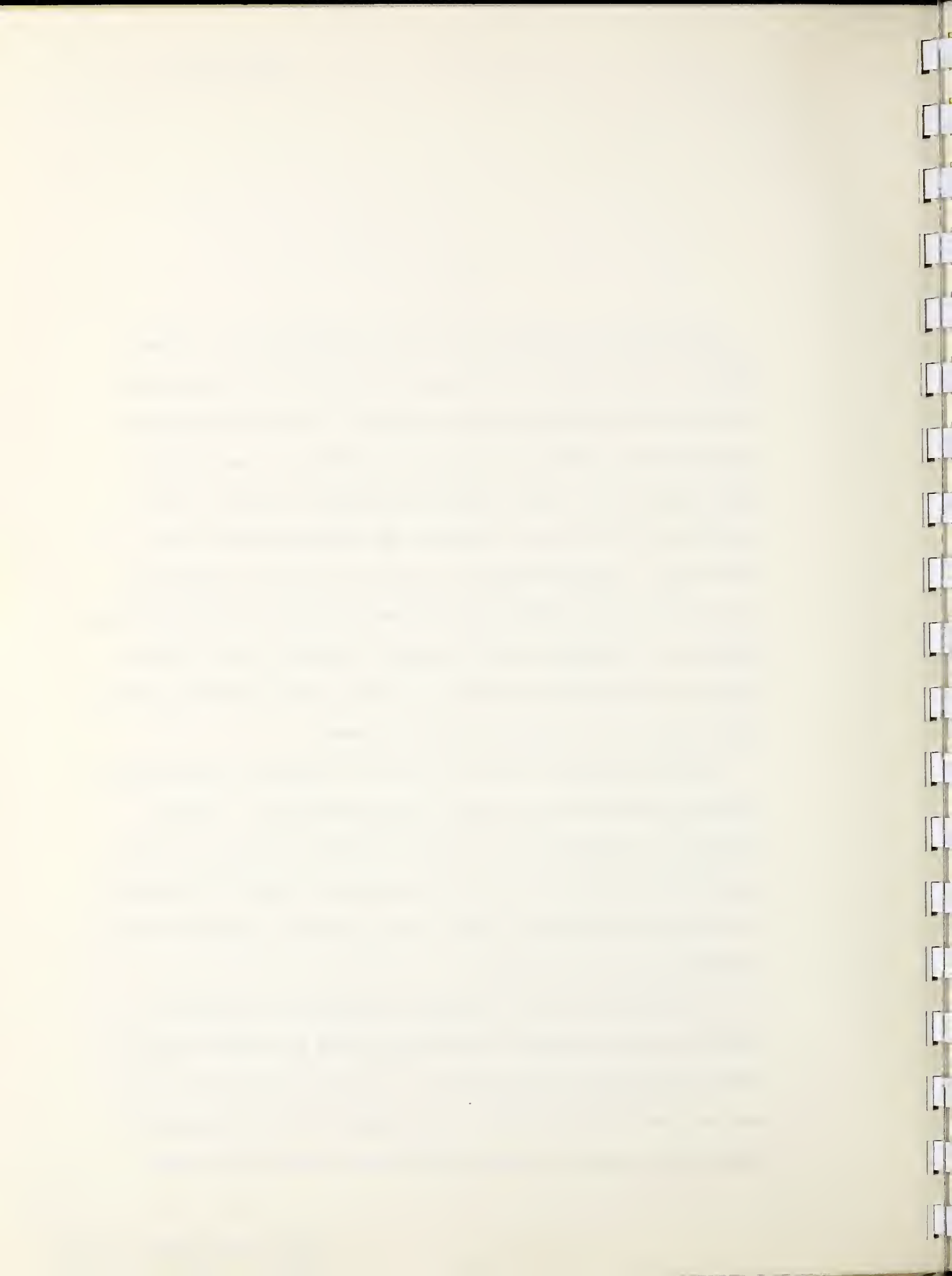
1. City and NRC will work together to promote the concept of utilizing the recycling plant combustible residue formed into controlled quality cubettes as a supplementary fuel at the Fort Wayne Municipal Power Plant.

- 3 -

2. City shall have prepared and file an application for a grant from the Federal EPA for the demonstration and in-depth evaluation of this entire "Resource Recovery System". Said application shall include necessary funds to construct facilities for the forming, and transporting of these salvage fuel cubettes from NRC to the City Power Plant, storing, handling, and feeding cubettes into the boilers. Said application to also cover a one-year demonstration and evaluation period at which time all phases of manufacturing, transporting, storing, feeding, burning, emissions, etc., will be rigorously monitored and recorded, as well as the character and flow rates of the various input and output streams.

NRC hereby agrees to assist the City as necessary in the preparation and execution of the federal grant applications. Said cooperation to include the use of their facility as part of the total Resource Recovery System, and the City taking a credit of \$1,200,000 as a portion of the City's share of the grant which represents NRC's existing recycling facilities.

3. If the federal grant is approved, NRC agrees to cooperate in satisfying the information requirements of EPA and supply material for the manufacture of the cubettes at no cost to the City for the one year demonstration period. It is understood that the cost of constructing, operating, maintaining, and monitoring the cubette



- 4 -

system shall be included as part of the grant cost and shall be completed at no cost to NRC.

4. At the end of the one year EPA program evaluation period City and NRC shall negotiate a price for the cubettes based upon the meaningful data that has been derived.

5. The City recognizes the importance that NRC plays in the Federal aid application and the total Resource Recovery System project and agrees to give full recognition to NRC and their facilities in each phase of the project development, including technical papers, press releases, reports, etc.

In witness whereof, the parties hereto have executed this Agreement the day and year first written above.

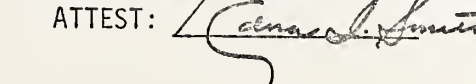
CITY

NRC

BOARD OF PUBLIC WORKS

NATIONAL RECYCLING CORPORATION




ATTEST: 


Barry Pass, Chairman of Board
of Directors

CITY OF FORT WAYNE, INDIANA



**NATIONAL
RECYCLING
CORPORATION**

5225 OLD MAUMEE ROAD • FORT WAYNE, INDIANA 46803 • PHONE (219) 749-9548

July 10, 1972

City of Fort Wayne
One Main Street
Fort Wayne, Indiana 46802

CURRENT CAPABILITY

Attention: Jerry Boswell, Ph.D., Chairman-Board of Public Works

Dear Dr. Boswell:

As requested, we shall review herein our current situation and capability for processing the solid waste of the Greater Fort Wayne Community.

We are currently receiving and processing for materials salvage or disposal, approximately 300 tons of waste within a 10-hour operation. We estimate that this is normally made up of approximately 120 tons of industrial waste and 180 tons of mixed municipal refuse which includes that from households, commercial, institutional establishments and small industries.

The waste is delivered to us by approximately 24 collection and hauling companies within Allen County and its environs.

In the terminology used in the industry, our facility would be nominally designated as having a capacity of 800 tons per day (24 hours). However, from a realistic standpoint, taking into account the material flow surges into our plant, equipment availability and need for a practical maintenance program, we consider our facility as having a real capacity of 500 tons per 24-hour day. Even so, we can readily accommodate a significant increase in tonnage of material over the average 300 tons currently received.

We anticipate that the cubette by-product made from the residual from the processing of mixed municipal waste would be 60% (108 tons), and the residual from the processing of industrial waste would be 30% (36 tons) of the raw industrial received. Our processing plant should provide cubettes which would be essentially free of metals, ceramics and dirt.

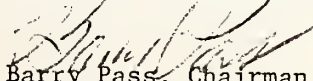
Depending on the season of the year, weather conditions, etc., we have found that paper fibre recovery for reuse will vary from 40% to 60% on industrial waste and from 0% to 20% on mixed municipal waste.

We look forward with hope and anticipation that the envisioned program for the City of Fort Wayne will finally materialize.

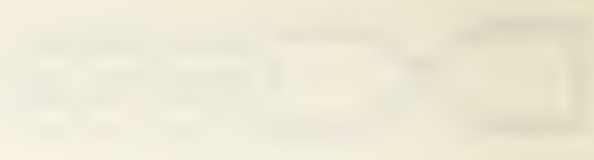
If there is any way that we can be of further assistance, please advise.

Yours very truly,

NATIONAL RECYCLING CORPORATION


Barry Pass, Chairman
Board of Directors

BP:rs



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**NATIONAL
RECYCLING**
CORPORATION

5225 OLD MAUMEE ROAD • FORT WAYNE, INDIANA 46803 • PHONE (219) 749-9548

October 15, 1970

Peoples Trust Bank
913 South Calhoun Street
Fort Wayne, Indiana

Attention: Mr. John Croker

Dear Mr. Croker:

Attached you will find the past history and five year projection for the Fort Wayne Reduction Company.

The Company was founded in 1966, by Sam Levin and Leonard Rifkin, to provide an outlet for the industrial refuse of Fort Wayne. At that time landfill sites were difficult to obtain, since the local zoning of any property for this purpose was almost impossible. They purchased a landfill site from Terminal Service Company, consisting of 153 acres and known as Allen County Landfill. Because of the short life of this site, they also obtained a potential landfill site on Old Maumee Road. After considerable investigation they constructed a corrugated paper salvage operation and incinerator on this site. At that time this presented the foremost technology in this field. It represented a monetary return on the metal and paper recovery and the burning provided a means for extending the length of the existing landfill sites. This operation, although profitable, became difficult with the high cost of labor and tightening air pollution laws.

I arrived in Indiana in 1968, to manage the construction of a paper mill in Eaton, Indiana for Clevepak Corporation, a New York City-based packaging firm. My entire career had been in the paper industry, and before buying an interest in Clevepak, I was Senior Vice President with Hoerner-Waldorf Corporation. In the course of investigating paper stock suppliers, I met the Rifkins and eventually they became our major supplier of waste paper for the Eaton Mill. During our association we developed the ideas for automating the separation of the paper and metal; but only after President Nixon's inaugural address did we make a decision to proceed with the present plant. I purchased a 20% interest in the Company, became its President and now have the responsibility of executing the plans.

The Fort Wayne plant will have the capacity of handling 400 Tons of refuse in a 10 hour day. A large percentage of Fort Wayne's industrial and commercial trash will be hauled under long term contract by Levin & Sons and San-A-Tainer Corporation, a Division of Superior Companies, to the plant. They will pay a dumping charge of \$3.00 to \$4.00 per Ton and the plant will solicit all other municipal and industrial waste haulers. We are currently receiving 5000 Tons per month and these projections are based on this figure. As of January 1, 1971 the State of Indiana will require every landfill in the state to be licensed and to be operated



**NATIONAL
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CORPORATION**

5225 OLD MAUMEE ROAD • FORT WAYNE, INDIANA 46803 • PHONE (219) 749-9548

October 15, 1970

Page Two

Peoples Trust Bank

in accordance with their standards. We expect to be licensed at that time, and we doubt if any other Fort Wayne site will meet their requirements. This should increase the inflow of material into our plant. Upon receiving this material, it is immediately fed into a giant shredder that grinds the material into uniform pieces. In further continuous processing, we are able to separate select paper, metal and glass. At the present time, we only intend to market the paper and metal, but with government pressures, it will only be a matter of time before a substantial market will exist for the glass.

The majority of the pilot operational studies have been made in conjunction with the American Pulverizer Company, in St. Louis, Missouri and the Triple S Dynamics Corporation in Dallas, Texas. The American Pulverizer Company is granting us an interest free deferred payment arrangement for their equipment. The trade name for the paper product, "Mixcor", has been registered and the papers are being processed in regard to the patent application. Our patent attorney, Mr. Al Jeffers, feels we have a reasonable opportunity to obtain a patent on the entire process.

Nationwide interest in this process and our plant has been considerable. We have been advised to consider seeking government grants for this first plant. This would, of necessity, reveal the process to all and would also impede our own progress. This would not be in the best interests of our stockholders. We have also had several venture capital companies approach us with offers of financial help in return for part ownership in the company, and several waste haulers, who are in serious trouble with landfill sites, want to join us and build a second plant. We feel we must prove the process before we can put in a second plant.

We have just recently engaged the services of a public relations advisor, Mr. Tom Dustin. As you know, he is one of Indiana's foremost environmentalists and is completely convinced that our concept is one of the real answers to our solid waste problem.

He will immediately develop our new name, and thru media and meetings, spread our name and concepts to the people of Fort Wayne and Indiana.

We shall look forward to your constructive criticism of this program as it unfolds. It is truly an exciting concept with its profit potential, but also in the satisfaction of helping to meet a crisis which threatens our nation's environment.

In this letter I have revealed very little about our future plans. We envision ourselves becoming one of the leaders in an industry that is just emerging. We will dedicate ourselves to the handling of materials resource conservation through proven scientific and engineered principles. We would involve ourselves in all the steps that are necessary for realistic resource recovery systems and pollution



**NATIONAL
RECYCLING**
CORPORATION

5225 OLD MAUMEE ROAD • FORT WAYNE, INDIANA 46803 • PHONE (219) 749-9548

October 15, 1970

Page Three

Peoples Trust Bank

control in this field.

If you have any questions, I will be happy to answer them.

Sincerely,

NATIONAL RECYCLING CORPORATION

Edward Law

Edward Law

EL:hj



**NATIONAL
RECYCLING**
CORPORATION

5225 OLD MAUMEE ROAD • FORT WAYNE, INDIANA 46803 • PHONE (219) 749-9548

February 8, 1972

*The City of Fort Wayne
Board of Public Works
City-County Building
Fort Wayne, Indiana - 46802*

Attention: J.D. Boswell, Ph.D. - Chairman

Dear Dr. Boswell:

As discussed, this letter confirms the intentions previously declared to the City of Fort Wayne prior to your appointment.

National Recycling Corporation is an established, growing enterprise in the business of materials salvage from the community's wastes.

Our automated salvage operation on Maumee Road recovers select paper, metal, and glass. However, there is a residual fraction which is impractical to salvage for market. This separated fraction is essentially combustible material having a heating value of 6,000 to 8,000 B.T.U. per pound.

Your Utility Engineers and ours are encouraged by the very successful trials at your steam - electric plant burning this salvaged fuel as cubettes, as a supplement to coal.

Should your program materialize to adapt the Municipal Power Plant to utilize this fuel salvaged from the wastes of the community, National Recycling Corporation is prepared to provide a continuing supply and of controlled quality.



**NATIONAL
RECYCLING**
CORPORATION

5225 OLD MAUMEE ROAD • FORT WAYNE, INDIANA 46803 • PHONE (219) 749-9548

February 8, 1972
Page -2-

The City of Fort Wayne

Should a Federal - E.P.A. research/evaluation program be undertaken in view of the potential to ease the fuels - energy situation as well as the waste disposal burden of many U.S. cities, National Recycling will cooperate and assist in every way we can.

The contemplated one-year investigation should also provide realistic cost - benefit data to permit forming an agreement beneficial to us both.

We hope your program can be implemented as soon as possible.

Sincerely,

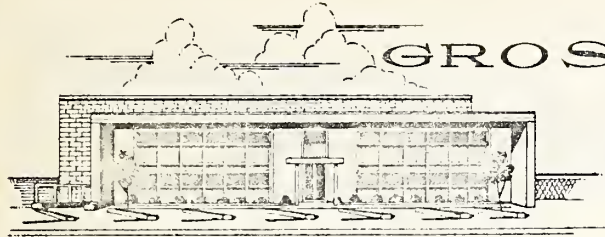
National Recycling Corporation

*Barry Pass, Chairman
Board of Directors*

BP:hj

I M P O R T E R S

E X P O R T E R S



GROSSMAN AND SONS, INC.

Graders & Brokers of Paper Stock

1960 SOUTH FOURTH ST. • COLUMBUS, OHIO 43207
PHONE: (614) 443-4601 • CABLE ADDRESS GROSSO.

July 11, 1972

National Recycling Company
5225 Old Maumee
Ft. Wayne, Indiana

Attention: Mr. Barry Pass
Chairman of the Board

Dear Mr. Pass:

I am writing you this letter to assure your company that the outlets of the type of materials you have been baling, and will continue to bale in the future, definitely has a good future.

The recycling business is now only in its infancy and our company will guarantee you that you will continue to have markets for a minimum of five to ten years on the same basis we have been curenly handling your paper.

Thank you very much for past cooperation.

Sincerely yours,

GROSSMAN & SONS, INC.


Arnold Grossman
President

AG/rak



PAPER STOCK • PROCESSORS RECLAIMED TEXTILES
• WIPING CLOTHS FOR INDUSTRIAL TRADE •



SCRAP BROKERS



3101 MAUMEE AVENUE • POST OFFICE BOX 1107

Levin & Sons, Inc.

TELEPHONE 743-5461 • AREA CODE 219
FORT WAYNE, INDIANA 46801

May 3, 1972

*Mr. Edward Law, President
National Recycling Corporation
5225 Old Maumee Road
Fort Wayne, Indiana - 46803*

Dear Ed:

One of the most exciting and potentially rewarding programs that I have ever been involved in is the one in which National Recycling has developed beneficiated solid waste fuel cubettes for energy conversion in the Fort Wayne Municipal Power Plant.

I understand that this program, which is a by-product of your already successful efforts in recycling of solid waste, is now close to reality and we certainly wish you complete success.

My company will continue to do everything possible to be of support and can assure you of our willingness and desire to maintain ourselves as a continuing market for any or all of your ferrous, non-ferrous and cellulosic fiber products.

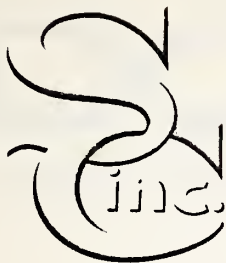
Congratulations.

Very truly yours,

Levin & Sons, Inc.

Sam Levin, President

SL:hj



SUPERIOR COMPANIES, INC.

1610 N. CALHOUN ST., FORT WAYNE, INDIANA 46808 • PHONE 219 422-5541

May 1, 1972

National Recycling Corporation
5225 Old Maumee Road
Fort Wayne, Indiana 46803

Attention: Ed Law
President

Gentlemen:

We wish to congratulate you on your efforts of recycling industrial and municipal waste material. We further wish to advise you that we have developed markets for all your recyclable products to date, and have ready markets available for all your ferrous and non-ferrous scrap material, as well as, all your paper products.

We are most anxious to begin servicing your company in relation to any items that you are ready to dispose of at this time. If we can be of any help to you in your segregation procedures in relation to value of recycled products, please do not hesitate to call.

Thank you very much for the opportunity of doing business with you.

Sincerely,

SUPERIOR COMPANIES, INC.

Leonard Rifkin
President

LR:lh



**NATIONAL
RECYCLING**
CORPORATION

5225 OLD MAUMEE ROAD • FORT WAYNE, INDIANA 46803 • PHONE (219) 749-9548

May 4, 1972

Board of Public Works
CITY OF FORT WAYNE
One Main Street
Fort Wayne, Indiana 46802

Attention: Jerry D. Boswell, Ph.D. Chairman

Subject: Glass Recycling

Dear Dr. Boswell:

We have been assured by Owens-Illinois, Inc. that they can accomodate within their Indiana facilities the total glass generated from the solid waste of the City of Fort Wayne.

Their plant at Gas City, Indiana produces 500 tons of glass products per day. If all the discarded glass were recovered in Fort Wayne, we would expect only 25 to 50 tons per day.

Chuck Depew, Vice-President, assured me that National Recycling Corporation will have a letter of intent from Owens-Illinois before the deadline for your final E.P.A. Grant Application.

Sincerely yours,

NATIONAL RECYCLING CORPORATION

Edward Law

Edward Law
President

EL:ah



STATE OF INDIANA
OFFICE OF THE GOVERNOR
INDIANAPOLIS



EDGAR D. WHITCOMB
GOVERNOR

August 26, 1971

The Honorable Harold S. Zeis
Mayor
City-County Building
Ft. Wayne, Indiana

Dear Mayor Zeis:

It has recently come to my attention that the City of Fort Wayne is evaluating the feasibility of burning municipal solid waste in its existing electrical generation plant. It is also my understanding that the process under evaluation includes the recovery, and salvage of various components from these municipal wastes prior to burning.

The City of Fort Wayne is to be commended in its attempt to utilize its community's waste in a beneficial way and to solve some of our more serious resource problems. I endorse the ultimate objectives of this demonstration project and wish you every success.

Sincerely,

Edgar D. Whitcomb

Edgar D. Whitcomb
GOVERNOR OF THE STATE
OF INDIANA

EDW:hb

WARREN G. MAGNUSON, WASH., CHAIRMAN
JOHN O. PASTORE, R.I.
VANCE HARTKE, IND.
PHILIP A. HART, MICH.
HOWARD W. CANNON, NEV.
RUSSELL B. LONG, LA.
FRANK E. MOSS, UTAH
ERNEST F. HOLLINGS, S.C.
DANIEL K. INOUE, HAWAII
WILLIAM B. SPONG, JR., VA.
NORRIS COTTON, N.H.
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HOWARD H. BAKER, JR., TENN.
MARLOW W. COOK, KY.
MARK O. HATFIELD, OREG.
TED STEVENS, ALASKA

FREDERICK J. LORDAN, STAFF DIRECTOR
MICHAEL PERTSCHUK, CHIEF COUNSEL

United States Senate

COMMITTEE ON COMMERCE
WASHINGTON, D.C. 20510

April 28, 1972

Honorable Ivan A. Lebamoff
Mayor
City of Fort Wayne
1 Main Street
Fort Wayne, Indiana 46802

Dear Ivan:

I have been informed of your efforts to initiate a program in Fort Wayne whereby solid waste matter will be compressed into cubettes and then used as fuel in the city's power plant.

Your proposal is a most innovative and exciting one and I only wish that more cities would demonstrate similar initiative in attempting to meet their growing energy needs in a way that is not at the same time damaging to the environment.

As I see it, your program is an excellent one in several respects. Not only will it cope with the deepening energy crisis and serve to maximize the substantial investment your citizens have in their municipal power plant, but through the project, the environment will be vastly improved and vital natural resources such as gas and coal will also be conserved.

I commend you and your administration for having the foresight and courage to proceed with this program. I am sure that by your efforts the entire Fort Wayne community will be greatly benefitted.

If I can in any way assist you in this deserving and worthwhile project, do not hesitate to call on me.

Sincerely,



Vance Hartke
United States Senator

BIRCH BAYH
INDIANA

United States Senate

WASHINGTON, D.C. 20510

May 1, 1972

Hon. Ivan A. Lebamoff, Mayor
One Main Street
Fort Wayne, Indiana 46802

Dear Ivan:

I have been observing with great interest the laudable effort the city of Fort Wayne has been making to contend with several of our most pressing problems by instituting an integrated, far-reaching program of pollution abatement.

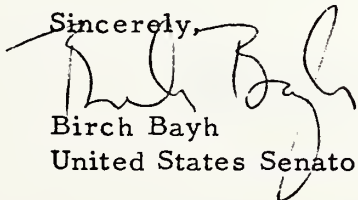
We all must take steps immediately to protect the environmental inheritance of our future generations. The programs in your area are to be commended in the highest degree.

This is especially pointed up by the steps you have taken in conjunction with the National Recycling Corporation to dispose of solid waste matter by transforming it into fuel for your city's municipal power plant.

I cannot overstate my support for this project, as this may well be an ideal solution to one of our most menacing problems.

If there is any way I can be of assistance, don't hesitate to call on me.

Sincerely,



Birch Bayh

United States Senator

J. EDWARD ROUSH
4TH DISTRICT, INDIANA

2400 RAYBURN BUILDING
WASHINGTON, D.C. 20515
CODE 202-225-4436

COMMITTEE ON
APPROPRIATIONS

SUBCOMMITTEES:
LEGISLATIVE
HUD, SPACE, SCIENCE

Congress of the United States
House of Representatives
Washington, D.C. 20515

October 22, 1971

Mr. Ron Bonar
Acting City Engineer
City-County Building
One Main Street
Fort Wayne, Indiana 46802

Dear Mr. Bonar:

I have received the copy of Fort Wayne's application for the project intended to convert solid waste into cubettes which would be used to fuel the electrical generation facilities of City Utilities.

Based on the engineering data and the letters accompanying your proposal, I believe that the idea may have great merit for the city. I want to assure you that I will do everything I can to comply with your request and will attempt to obtain early review and approval of your application.

I will keep you informed of my efforts in behalf of this project, and I hope you will keep me informed of developments within the city that could aid those efforts.

Sincerely,



J. EDWARD ROUSH
Member of Congress

JER:jbm

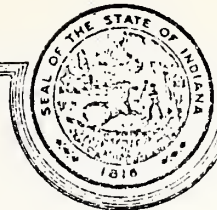
cc: Mayor Harold S. Zeis
Board of Works

RECEIVED

OCT 26 1971

Water Pollution Control Engr. Dept.
City-County Building, One Main St.
Ft. Wayne, Indiana 46802

STATE OF INDIANA



INDIANAPOLIS 46206

AIR POLLUTION CONTROL BOARD
1330 WEST MICHIGAN STREET

67945461 633-4420

July 1, 1971

Hon. J. Edward Roush
United States Congress
2400 Rayburn Building
Washington, D. C. 20515

Dear Congressman Roush:

Re: City Utilities Plant
Fort Wayne, Indiana

In response to your inquiry of June 21, 1971, regarding correction of conditions at the Fort Wayne Utilities plant, I wish to report that smoke may continue for sometime. A new gas-fired boiler, to replace the load on three coal-fired boilers, will be installed soon. However, because of the shortage of gas as an energy source, its planned use to correct this problem may be limited to operation in warm weather only when residential gas demands are low.

Total correction of this problem now hinges on the City of Fort Wayne's efforts to utilize the burnable portion of its municipally-collected wastes as a specially prepared pelletized fuel. This will be mixed with their coal to improve burning conditions to eliminate smoke and sulfur dioxide, reduce fuel costs, and minimize waste disposal costs. I am interested in this approach as a solution to these problems as well as a possible solution to a solid waste problem and the general fuel shortage problem.

The City of Fort Wayne has requested financial assistance from the Environmental Protection Agency to ascertain the feasibility of this program. Since you represent the Fort Wayne area, you may wish to follow this application for release of Federal funds.

Very truly yours,

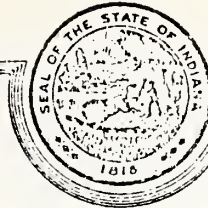
Perry E. Miller
Technical Secretary

MLOlson/se

cc: Hon. Harold S. Zeis, Mayor
City of Fort Wayne

EXHIBIT A

STATE OF INDIANA



INDIANAPOLIS 46206

AIR POLLUTION CONTROL BOARD
1330 WEST MICHIGAN STREET

633-4420

July 8, 1971

RECEIVED

JUL 12 1971

Mr. Ronald L. Bonar
City-County Building
1 Main Street
Fort Wayne, Indiana 46802

Water Pollution Control Engr. Dept.
City-County Building, One Main St.
Ft. Wayne, Indiana 46802

Dear Mr. Bonar:

Re: Fort Wayne Demonstration Project on
Pelletized Solid Wastes as Fuel for
Power Generation

This will inform you that the Divisions of Air Pollution Control and Sanitary Engineering of the State Board of Health endorse the City of Fort Wayne's project on "Evaluation of Pelletized Solid Wastes as Salvage Fuel for Municipal Electric Generation."

At the June 8, 1971, conference in Fort Wayne, attended by representatives of the City of Fort Wayne, the Federal Environmental Protection Agency, National Recycling Corporation and the State Board of Health, emphasis was placed on the need for recycling solid wastes as part of our waste disposal program, the need for additional fuel supplies for our economy, and the need to control air and water pollution. Utilizing underfeed stoker-type boilers throughout the country, for municipalities, institutions and even those for industry, may solve or help solve all three needs. This demonstration project could prove this concept.

We do not at this time have a list of facilities throughout Indiana that would be similar to the Fort Wayne generating plant which would enable them to utilize this type of fuel. There are without doubt 100 or more boilers with underfeed stokers, including some that have recently been converted to using gas or placed in standby service for economic reasons. For example, one company located near Fort Wayne manufactures corrugated paper stocks. They may possibly purchase raw materials from National Recycling Corporation. They burn 200 tons of coal per day with an underfeed stoker.

Of interest to you, also, is the enclosed listing of electric generating plants within Indiana. Most of the smaller plants listed are equipped with underfeed or chain grate stokers although some likely use spreader stokers that would require efficient flyash collectors.

EXHIBIT B

Mr. Ronald L. Bonar

July 8, 1971

Enclosed also is a copy of a recent newspaper article on automotive waste crank case oil disposal. Visualize what effect the use of this would have on the Btu value of this pelletized fuel and on the solution of another important waste disposal problem.

Very truly yours,



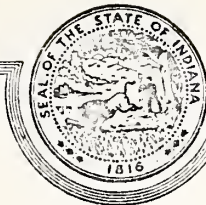
Perry E. Miller
Technical Secretary

MLOlson/cw

Enclosures

cc: Mr. Fred S. Ehrman, Chairman
Fort Wayne Dept. of Public Works
Mr. Edward Law, President
National Recycling Corporation

STATE OF INDIANA



INDIANAPOLIS 46206

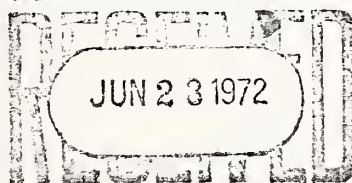
AIR POLLUTION CONTROL BOARD

1330 WEST MICHIGAN STREET

RECEIVED
(317) 633-4420

June 22, 1972

BOARD OF PUBLIC WORKS



Mr. Ronald L. Bonar
Board of Public Works
City of Fort Wayne
City-County Building
One Main Street
Fort Wayne, Indiana 46802

Dear Mr. Bonar:

Re: Resource Recovery System Demonstration
For Federal Grant Application

This will inform you that the Air Pollution Control Board has reviewed the latest proposal of the City of Fort Wayne titled "Request for Resource Recovery Systems Demonstration Grant." Once again this project is given full endorsement.

Fort Wayne is to be commended in facing a problem that concerns all municipalities, both large and small, in proposing a solution to that problem that will promote benefits in several areas. This approach comes close to the ultimate goal of total recycling of all materials. Furthermore, a cursory appraisal indicates it should show the greatest economic benefits of any recovery system, and could aid in relieving our critical energy problems.

Attachments in your report show the trend in fuel costs, both to the City of Fort Wayne as well as a large private power generating company, and indicate the importance of recovering energy values in otherwise discarded municipal wastes. Attachments showing listings of available heat generating boilers throughout the country that could utilize fuels of this nature confirm the Board's position expressed in correspondence dated July 8, 1971. That correspondence stated, without doubt, 100 or more suitable boilers could be located in Indiana. This is still true.

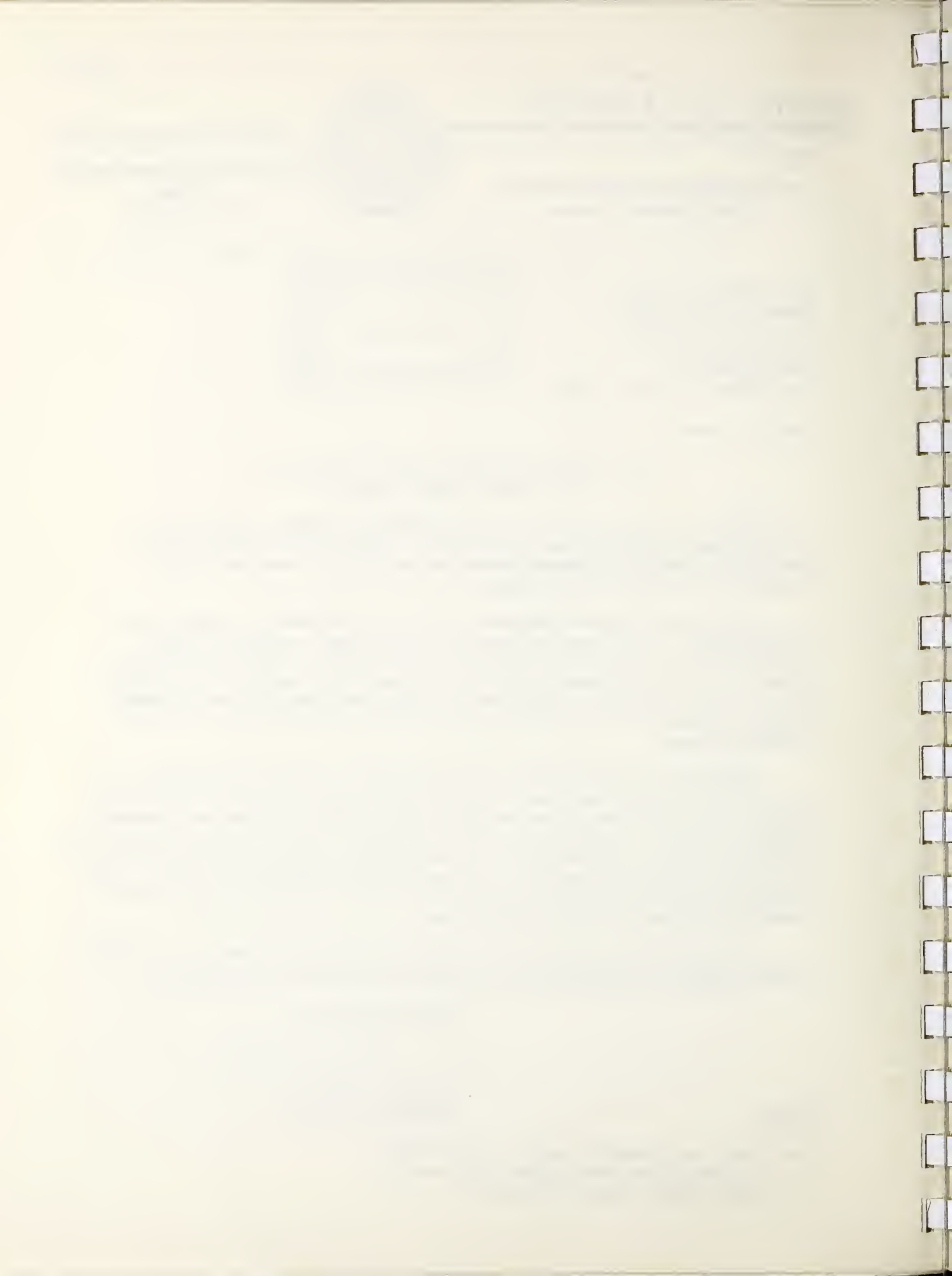
The Environmental Protection Agency is requested, herewith, to provide needed funding to demonstrate the system for solid waste management.

Very truly yours,

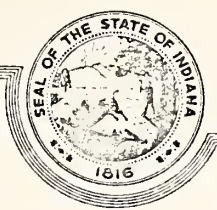
Perry E. Miller
Technical Secretary

ML0/es

cc: Hon. Ivan Lebamoff, Mayor of Fort Wayne
Mr. Ronald Van Mersbergen, EPA, Region V
Allen County Health Department



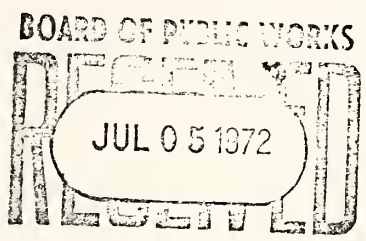
STATE OF INDIANA



INDIANAPOLIS

STATE BOARD OF HEALTH

Address Reply to:
Indiana State Board of Health
1330 West Michigan Street
Indianapolis, IN 46206



June 27, 1972

Mr. Ronald L. Bonar
Board of Public Works
City of Fort Wayne
City-County Building
One Main Street
Fort Wayne, Indiana 46802

Dear Mr. Bonar:

Re: Resource Recovery System Demonstration
Federal Grant Pre-application

We have reviewed the pre-application and supporting documentation submitted by the City of Fort Wayne and entitled "Request for Resource Recovery Systems Demonstration Grant." We have had knowledge of the City's intention relative to the demonstration project for quite some time prior to the submission of an application in September, 1971.

It is a pleasure to work with the officials of the City of Fort Wayne and the members of industry that are cooperating in the study and demonstration. They are experienced, capable and aggressive in the program of material recycling and the production of electric energy.

The report submitted and attachments therein reveal the details of the unique benefits to be derived from the recycling of waste materials, the preparation of the pelletized combustible material for use in the municipal electric plant, and the improvement of the environment by reduction of air pollution as well as excellent solid waste disposal.

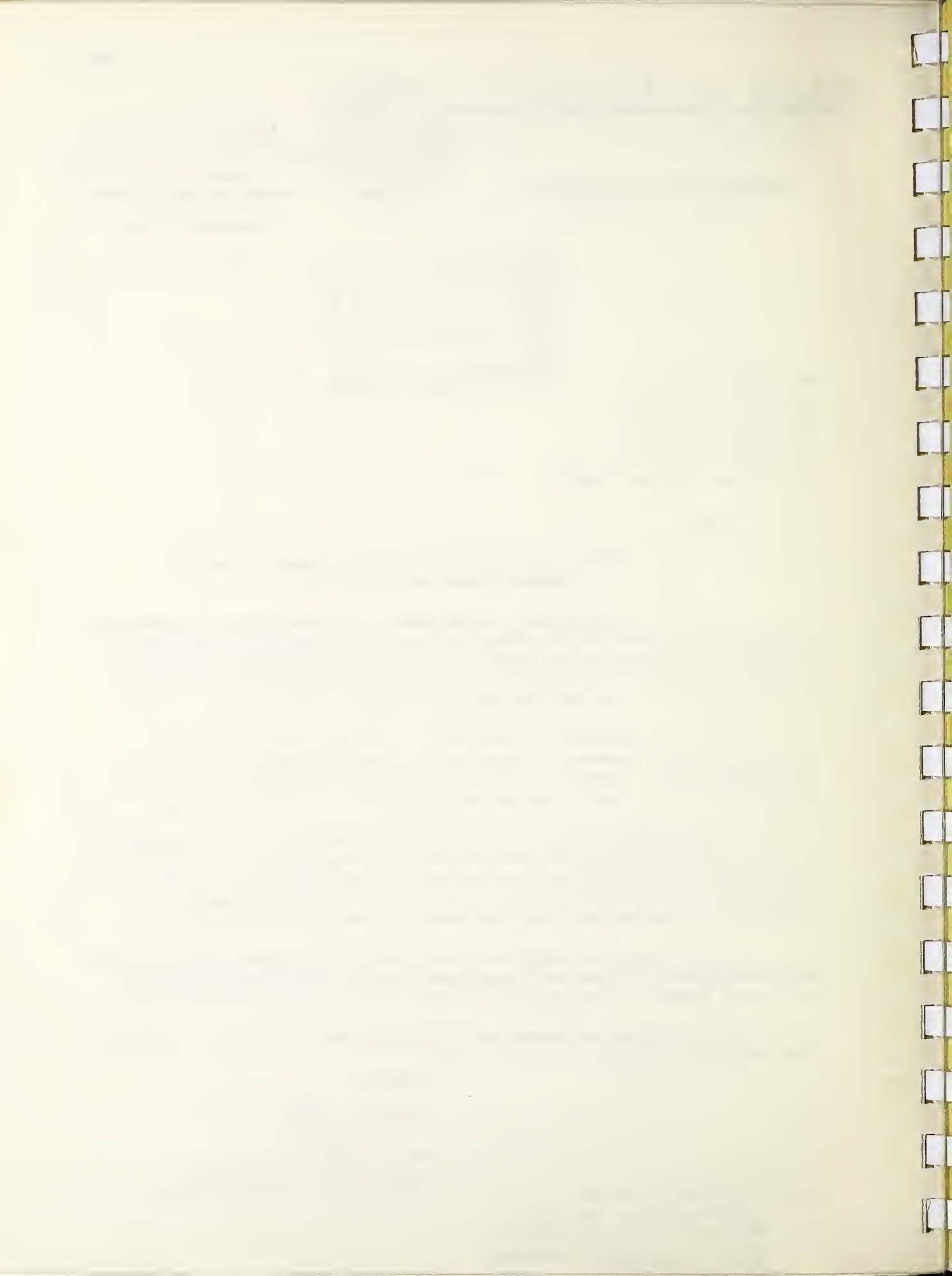
Fort Wayne officials have shown that they propose a project that will demonstrate a number of innovations in solid waste management that will be of benefit to municipalities and industry throughout the country.

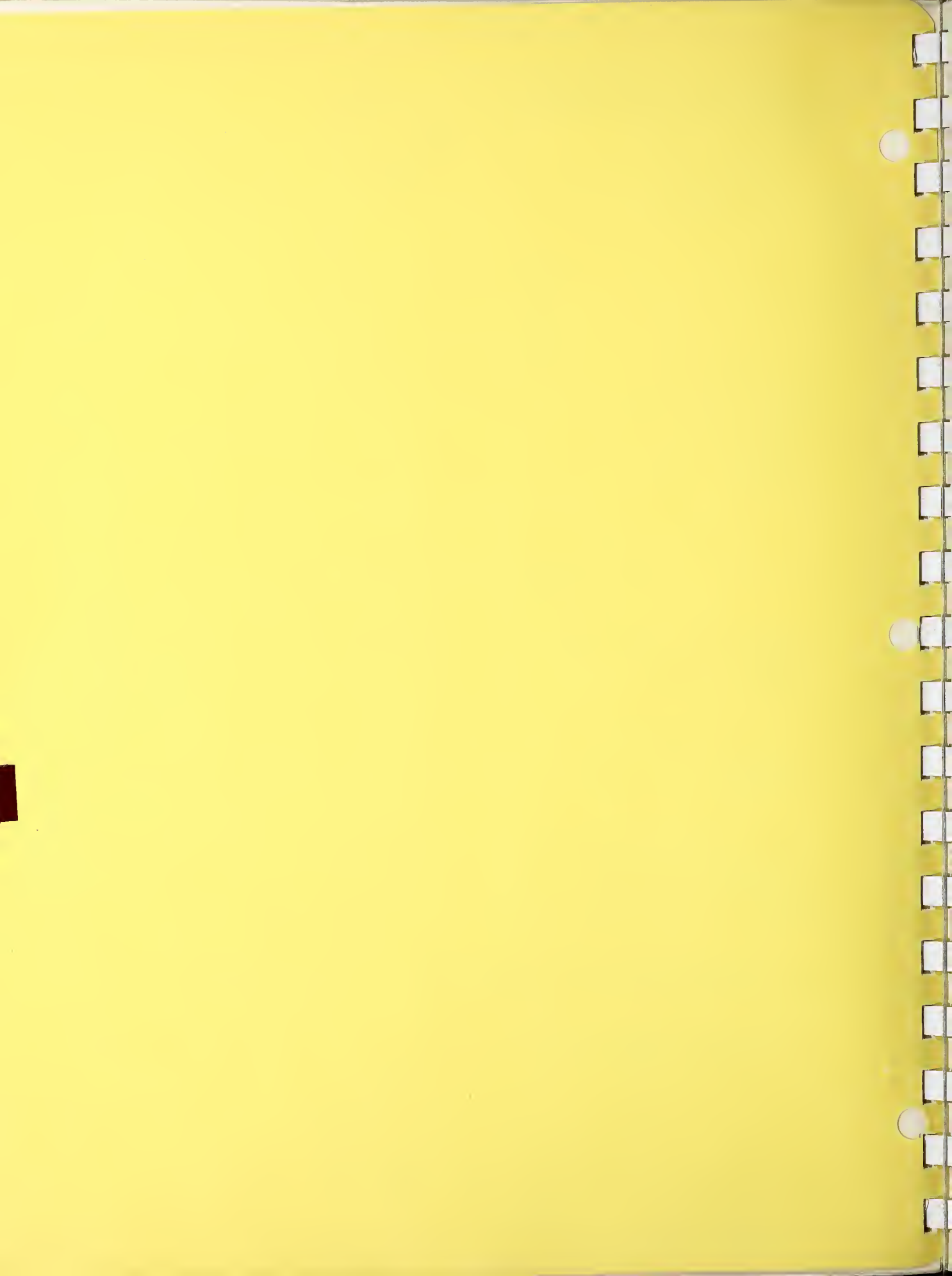
We urge the Environmental Protection Agency to assist in funding the project as requested.

Sincerely,

A. C. DEPUTT, M. D.
STATE HEALTH COMMISSIONER
INDIANA STATE BOARD OF HEALTH

cc: Hon. Ivan A. Lebamoff,
Mayor, City of Fort Wayne
William Q. Kehr, EPA, Region V
Allen County Health Department
W.P.C. Engineering





THREE RIVERS
ENVIRONMENTAL CONTROL BOARD

Room 608

423-7309

Dr. Maurice Felger, Chairman
Frank Webster, Vice-Chairman

Members: Clarence Smith, Phil Steigerwald, Harry Blosser,
Mrs. William F. Edwards, William G. Williams,
Robert I. Giant, Richard Ellenwood, and Dr. Oliver Kaiser.

The Three Rivers Environmental Control Board is a sub-commission of the Three Rivers Coordinating Council, planning authority for Allen County, created primarily to improve and protect our natural environment. The primary functions of this board would be in the area of water, air, and land pollution.

* * * *



The Three Rivers Coordinating Council

City-County Building

One Main Street

Fort Wayne, Indiana 46802

Elias G. Samaan
Executive Director

Phone 423-7309

July 10, 1972

Mr. William E. Gentner
Urban Affairs Coordinator
Department of Urban Affairs
City-County Building
One Main Street
Fort Wayne, Indiana 46802

Dear Bill:

At a time when solid waste management and our nation's fossil fuel supply are becoming a critical problem not only nationally but particularly in the Fort Wayne area, I am pleased in seeing Fort Wayne's application for a program to salvage fuel from the community's solid wastes.

As you know, since the 1970 fossil fuel shortage, the price of all fuels have skyrocketed. Now with the possibility of burning "cubettes" in conjunction with coal, the cost of producing electricity can be held to a minimum. The burning of cubettes (made up of waste paper fiber, wood, rubber, etc., now being deposited in land fill sites at a rate of about 1,250 tons per month) can now be burned as fuel and at a substantial saving of land needed for urban development projects. These significant aspects should provide a great saving in material, energy, and land resources to Greater Fort Wayne and the Allen County Region.

It is my opinion that the Fort Wayne "cubettes" program not only will aid in prolonging the life of land needed for solid waste disposal, but will relieve the pressing need for fossil fuels, aid in the control of air pollution and extend the use of the City's investment in steam-electric generating capacity.

I'm confident there are hundreds of municipalities and private industries throughout the Tri-State area alone who face the same problems now being pursued by the City of Fort Wayne. The City's efforts and accomplishments in the "cubette" program will, therefore, be of great interest to them and industry throughout the United States.

I, therefore, give this program my full support and will be happy to help in any way.

Please keep me informed as to the progress of this program.

Sincerely,

Elias G. Samaan

Elias G. Samaan
Executive Director
EGS:bam



The Three Rivers Coordinating Council

City-County Building

One Main Street

Fort Wayne, Indiana 46802

October 20, 1971

Elias G. Samaen
Executive Director

Phone 423-7309

TO: Three Rivers Coordinating Council

FROM: Environmental Control Board

SUBJECT: Evaluation of "Solid Waste Cubettes as Salvage Fuel for
Municipal Electric Generation"

In consultation with recognized authorities in their field, the Environmental Control Board has reviewed and finds the proposal (Evaluation of Solid Waste Cubettes as Salvage Fuel for Municipal Electric Generation, submitted by Roy F. Weston, Inc., Environmental Scientists and Engineers) to be basically sound and practical, to present no environmental problem, and recommends it be pursued as a demonstration project as it is intended.

The results obtained could well provide a partial solution to the problem of solid waste disposal, and at the same time provide a partial replacement for the fossil fuel requirements of the plant. This, in turn, will extend the life of current fossil fuel supplies.

The use of cubettes with coal will significantly reduce the concentration of SO₂ and particulate emissions in the stack gases of our City Light Plant.

The Board sees as added benefits from the program:

1. Extension of the life of present sanitary landfill sites.
2. Results which may be readily adaptable to other local fossil-fueled operations.

It was the consensus of the consultants that the plan of operation and monitoring of the results were well considered and quite adequate with one exception: it is recommended that the condition of specified existing boiler tubes be followed as well as the newly installed tubes.

It was agreed that the presence of certain chlorine-containing plastic materials will result in the generation of hydrogen chloride (HCl) gas, in proportion to their presence in the combustible material.

THREE RIVERS
ENVIRONMENTAL CONTROL BOARD

Room 608

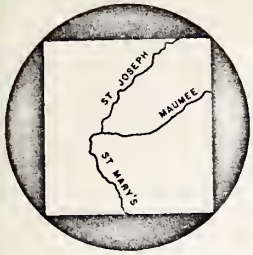
423-7309

Dr. Maurice Felger, Chairman
Frank Webster, Vice-Chairman

Members: Clarence Smith, Phil Steigerwald, Harry Blosser,
Mrs. William F. Edwards, William G. Williams,
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The Three Rivers Environmental Control Board is a sub-commission of the Three Rivers Coordinating Council, planning authority for Allen County, created primarily to improve and protect our natural environment. The primary functions of this board would be in the area of water, air, and land pollution.

* * * *



The Three Rivers Coordinating Council

City-County Building

One Main Street

Fort Wayne, Indiana 46802

Elias G. Samaan
Executive Director

Phone 423-7309

July 10, 1972

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Urban Affairs Coordinator
Department of Urban Affairs
City-County Building
One Main Street
Fort Wayne, Indiana 46802

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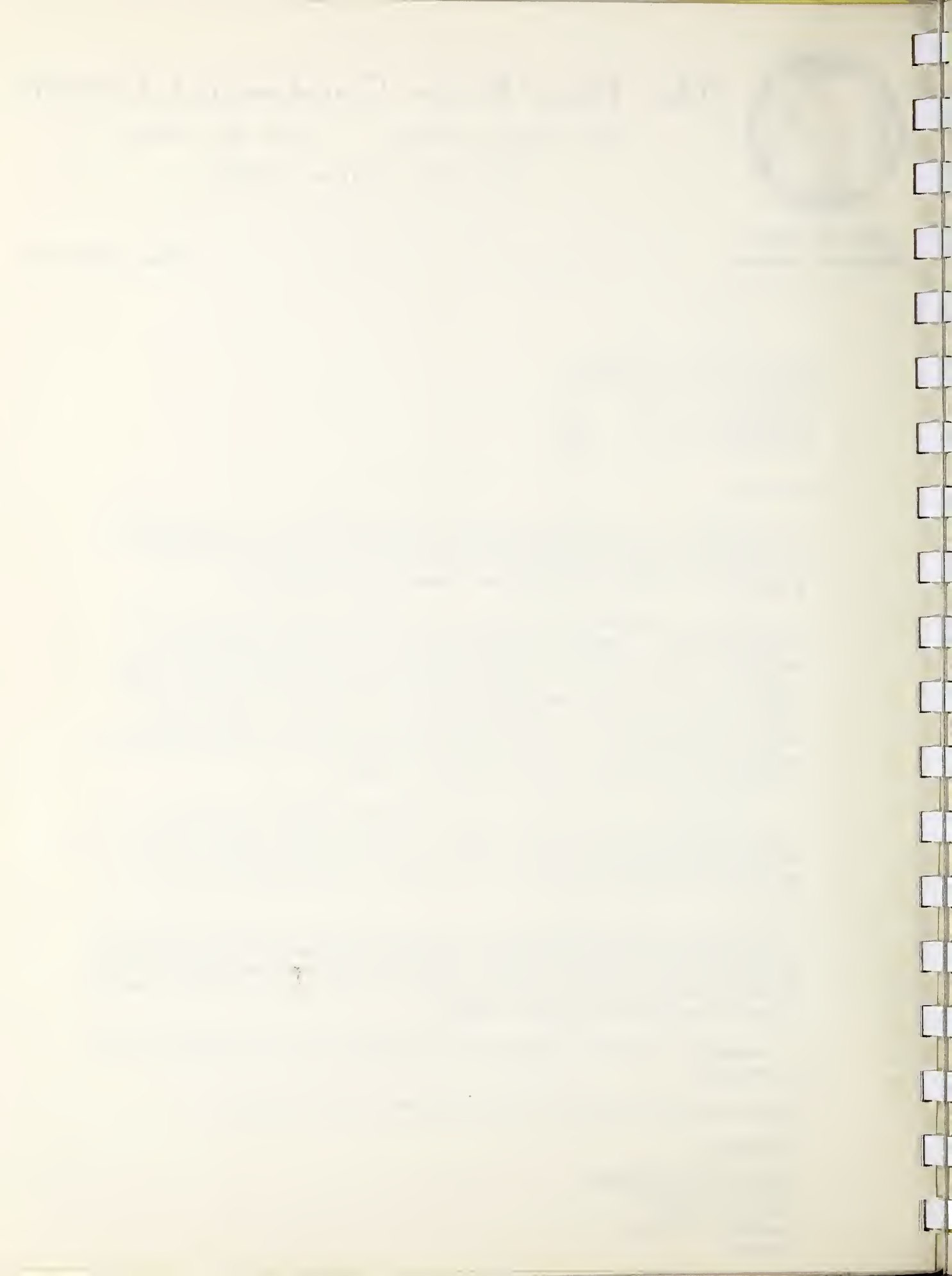
I, therefore, give this program my full support and will be happy to help in any way.

Please keep me informed as to the progress of this program.

Sincerely,

Elias G. Samaan

Elias G. Samaan
Executive Director
EGS:bam





The Three Rivers Coordinating Council

City-County Building

One Main Street

Fort Wayne, Indiana 46802

October 20, 1971

Elias G. Samaan
Executive Director

Phone 423-7309

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1. Extension of the life of present sanitary landfill sites.
2. Results which may be readily adaptable to other local fossil-fueled operations.

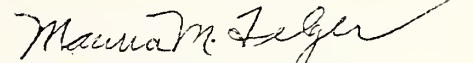
It was the consensus of the consultants that the plan of operation and monitoring of the results were well considered and quite adequate with one exception: it is recommended that the condition of specified existing boiler tubes be followed as well as the newly installed tubes.

It was agreed that the presence of certain chlorine-containing plastic materials will result in the generation of hydrogen chloride (HCl) gas, in proportion to their presence in the combustible material.

While these concentrations in the flue gas will be small and probably present no pollution problem, the effect of their presence on boiler tubes is unknown. Although this presents a possible hazard to equipment, it is the considered opinion that the risk is minimal if the projected controls are utilized.

Respectfully submitted,

THREE RIVERS COORDINATING COUNCIL
Environmental Control Board



Maurice M. Felger, Ph.D.
Board Chairman

MMF/jr

Participants

Environmental Control Board - 10 members

Ron Bonar (City Engineer)
Richard Hornberger (Oil)
Mark Tam (Power Generation)
Elizabeth Marshall (Environmental Consultant)
Newell Cunningham (City Light)

Ron Bonar - City Engineer for the City of Fort Wayne

Richard Hornberger - Inland Oil Company

Mark Tam - Power Engineer for General Electric Company, Fort Wayne

Elizabeth Marshall - Environmental Consultant Fort Wayne-Allen County
specializing in solid waste disposal

Newell Cunningham - Superintendent of Fort Wayne City Utilities Power Plant



**NATIONAL
RECYCLING**
CORPORATION

5225 OLD MAUMEE ROAD • FORT WAYNE, INDIANA 46803 • PHONE (219) 749-9548

May 4, 1972

Board of Public Works
CITY OF FORT WAYNE
One Main Street
Fort Wayne, Indiana 46802

Attention: Jerry D. Boswell, Ph.D. Chairman

Subject: Citizen Environmental Action Organizations

Dear Dr. Boswell:

We had hoped to have to you, in time to be included with the E.P.A. Grant Pre-Application, an endorsement from two major environmental groups in the greater Fort Wayne area.

The Fort Wayne total resource recovery program has been discussed in depth with the Izaak Walton League and the Coalition For The Environment. Responsible leaders of both groups have personally endorsed our program, but they must take the necessary steps to clear this through their executive boards. I am confident these letters will be received in time for your final E.P.A. Grant Application.

We apologize for this delay.

Sincerely yours,

NATIONAL RECYCLING CORPORATION

Edward Law

Edward Law
President

EL:ah

FORT WAYNE CHAPTER

Isaak Walton League of America, Inc.

DEFENDER OF SOIL, WOODS, WATERS AND WILD LIFE

17100 GRIFFIN RD., HUNTERTOWN, INDIANA 46748

OFFICE OF

PRESIDENT ☐
VICE PRESIDENT ☐
SECRETARY ☐
MEMBERSHIP SECY. ☐
TREASURER ☐



May 22, 1972

Hon. Ivan Lebanoff, Mayor
City County Bldg.
Fort Wayne, Indiana

Re: Solid Waste Cubits Salvage fuel for
City Utilities Demonstration project
(Resource Recovery Systems Grant)

Dear Mayor:

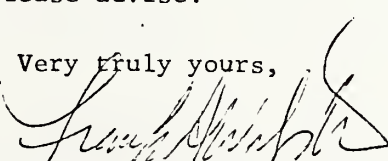
As President of the Fort Wayne Chapter, IWLA, Inc., I wish to on its behalf express our complete and enthusiastic support of the above project. This project has been discussed in a combined board and membership meeting and received unanimous support.

The possibilities of this project which has had good results on a pilot project are quite tremendous not only from a lost cost fuel with inexpensive conversion and control costs standpoint, but also environmentally as the emissions should be within the Federal Air Quality Standards particularly as to sulphur dioxide.

Not only will the effect be advantagous to City Utilities but the other institutional and industrial plants relying on high sulfate fuels can easily follow suit without significant investment costs.

If I can be of further assistance, please advise.

Very truly yours,


Frank A. Webster, President
IWLA, Ft. Wayne Chapter

FAW/pg

CC: Ron Bonar
Newell Cunningham
Sharon Harris
Sam Ropchan

Mrs. Tom Dustin
Mrs. Ethyle Bloch
Dennis Winters
Prof. Dave Cormier

William Kern
Robert Beery
Ken Cole
John McCory

Dr. Austin Fergusson
Tom Riddle
Roy S. Dale

FORT WAYNE CHAPTER

Izaak Walton League of America, Inc.

DEFENDER OF SOIL, WOODS, WATERS AND WILD LIFE
17100 GRIFFIN RD., HUNTERTOWN, INDIANA 46748

OFFICE OF

PRESIDENT ☐
VICE PRESIDENT ☐
SECRETARY ☐
MEMBERSHIP SEC'Y. ☐
TREASURER ☐



May 23, 1972

Mr. William Ruckelshaus, Administrator
Environmental Protection Agency
Executive Office of the President
Washington, D. C.

Dear Mr. Ruckelshaus:

The Environmental Protection Agency has on file an application from the City of Fort Wayne for a grant dealing with the city-owned electric power generating plant. I believe you are personally familiar with this plant, or have seen it during your visits to Fort Wayne.

Affirmative action on the application by EPA would facilitate important pilot work and evaluation of a fuel-averaging technique utilizing pelletized paper as the supplemental fuel. EPA undoubtedly realizes that hundreds of smaller power plants throughout the country will probably not be able to finance particulate and SO₂ emission controls, yet they provide a valuable service in many cases.

While natural disasters are improbable, the Palm Sunday tornadoes here can never be forgotten, during which all five incoming transmission lines of the private power utility were broken, and the City Light plant provided the only significant source of power to maintain vital public services. This is but one reason why the municipal plant should be continued here. The Izaak Walton League's position is that if this plant is to continue operation, it must meet reasonable emission standards, or it must cease operation.

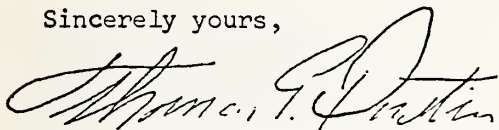
We are certain that this same pressure applies to many other similar plants elsewhere in the country. Therefore, since more sophisticated means of emission control may not be feasible here (and at similar plants elsewhere), it would seem highly desirable to execute this demonstration program. Naturally, we are interested in high emission standards here, but the strategic view is that if the results are promising here, they might be projected to many other problems elsewhere too.

We therefore hope EPA will approve the application. It is probably worth nothing also, that the pelletized paper represents a form of renewable energy resource, while fossil fuels are non-renewable. If the pelletized paper method proves workable, the technique will at least in some degree retard the drain on non-renewable fuels.

It will also reduce a growing disposal problem, generate a new and promising industry, and produce a substantial reduction in SO₂ emission problems.

Thank you for your interest.

Sincerely yours,

A handwritten signature in dark ink, appearing to read "Thomas E. Dustin". The signature is fluid and cursive, with a large, prominent initial "T".

Thomas E. Dustin, Executive Secretary
Indiana Division, Izaak Walton League of America

c: The Hon. Ivan Lehamoff
Mr. Frank Webster

PURDUE UNIVERSITY

FORT WAYNE REGIONAL CAMPUS
SECTION OF BIOLOGICAL SCIENCES
2101 COLISEUM BOULEVARD EAST
FORT WAYNE, INDIANA 46805

May 1, 1972

Ivan Lebamoff, Mayor
City of Fort Wayne
City County Building
Fort Wayne, Indiana

Dear Ivan:

I am writing to tell you how pleased I am that the City of Fort Wayne is finally at the stage of submitting its "pre-application grant" to the Environmental Protective Agency for obtaining pollution abatement funds. I believe, that by obtaining funds for modifying "City Lights" boiler equipment, you are adhering to your campaign promises and showing your deep emotional as well as intellectual committment to the environmental movement.

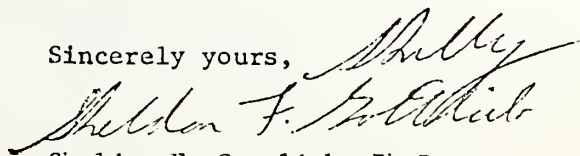
From my vantage point and interests, modifying the boilers so as to use the fuel cubettes made from mixed municipal solid waste by the National Recycling Company of Fort Wayne should have several positive environmental benefits:

1. reduce the size of the municipal solid waste disposal problem.
2. & 3. reduce coal consumption thereby helping to preserve our fossil fuel reserves and in a small way, help contribute to decreasing the mining interests' rape of the earth.
4. & 5. reduced coal consumption by substitution of these cubettes should decrease sulfur dioxide and smoke production and thereby reduce Fort Wayne's contribution to the air pollution problem.
6. enhance the importance of recycling as a positive addition to the anti-pollution armamentarium.

I believe your leadership in this multifaceted pollution abatement program combining City and local industrial talent and facilities is deserving of praise especially since such action will help keep Fort Wayne amongst the leading environmentally aware communities of the U.S.A. Further, this leadership role should provide impetus to the local industries to "clean-up" since they will no longer have City Lights as a "whipping boy" behind whom they can hide.

With best personal regards and best wishes for the success of this auspicious project, I am

Sincerely yours,



Sheldon F. Gottlieb, Ph.D.
Professor, Biological Sciences

cc: Mr. Barry Pass

THE JOURNAL-GAZETTE

PHONE 742-5111

600 WEST MAIN ST.
FORT WAYNE, INDIANA 46802

EDITORIAL DEPARTMENT

July 12, 1972

The Hon. Ivan A. Lebamoff
Mayor, City of Fort Wayne
City-County Building
Fort Wayne, Indiana 46802

Dear Ivan:

I have made a thorough study of municipal electric utilities in Indiana culminating in a published series of articles seeking public awareness of the economic and ecological problems facing these numerous small utilities.

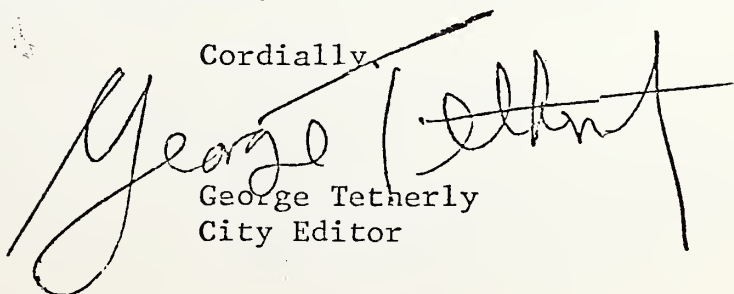
I wish to commend and encourage your efforts to modify the City Light Power Plant to utilize solid waste cubettes, thereby coping with two of the more pressing problems of the community.

This concept recovers the energy in the wastes of our community while contributing to environmental enhancement through the reduction in air, water and land pollution.

We all favor conservation, and the program you have underway should not only contribute to conservation of some of our irreplaceable natural resources but will aid in satisfying the energy needs of our citizens and their progeny.

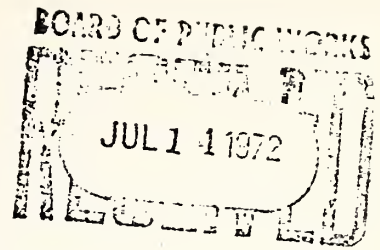
With best personal regards,

Cordially,

A large, stylized handwritten signature in dark ink, appearing to read "George Tetherly". The signature is written over the printed name and title.

George Tetherly
City Editor

GT/h



Mrs. Sally Witwer
4136 Trier Road
Fort Wayne, Indiana
for the Fort Wayne-Allen County
League of Women Voters

Mr. Ron Bonar
City Engineer
City-County Building
One Main Street
Fort Wayne, Indiana

Dear Ron,

We of the Fort Wayne-Allen County League of Women Voters are interested in giving our support to the City Light cubette project that the city would like to undertake. We are pleased with the results of the testing of the cubettes for fuel and are also pleased about the city's application for federal funds to the EPA.

We recognize the many advantages to Fort Wayne, its citizens and to the future development of cleaner and cheaper fuels in other cities by the testing and operation of this new fuel in our city. We are very anxious to see efforts such as this in Fort Wayne because like everyone else we desire a cleaner and more pleasant environment.

We feel the project will have several positive environmental Benefits:

- Reduce the size of the municipal solid waste disposal problem
- Reduce coal consumption thereby helping to preserve our fossil fuel reserves and help contribute to decreasing mining interests' rape of the earth.
- Reduced coal consumption by substitution of these cubettes should decrease sulfur dioxide and smoke production and therefore reduce Fort Wayne's contribution to the air pollution problem.
- Enhance the importance of recycling as a positive addition to the anti-urbanization.
- Set an example to industries and Fort Wayne citizens.

For these reasons, we add our support and best wishes for the success of this exciting project.

Very truly yours,

Mrs. Sally Witwer

Sally Witwer
Chairman of the Environmental Quality
Committee of the Fort Wayne-Allen County
League of Women Voters with
League approval and backing

BECKMAN
YODER and

SEAY INC planners and landscape architects pittsburgh fort wayne saint paul

July 12, 1972

Honorable Ivan A. Lebamoff,
Mayor, City of Fort Wayne
City-County Building
Fort Wayne, Indiana 46802

Dear Mayor Lebamoff:

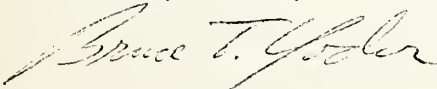
As President of the Indiana Chapter of the American Institute of Planners, as a consultant involved in city and environmental planning, and as a Fort Wayne area resident and businessman active on several city improvement committees, I endorse the proposed "cubettes" program for the City of Fort Wayne.

This endorsement is based upon my review of the "cubettes" program information provided for me by David Vervalin of the City's Department of Urban Affairs in his letter dated July 5, 1972. I have also discussed the proposed program with other environmental planners and engineers.

At a time when urban problems seem to be developing faster than solutions for urban problems, it is encouraging to see the City of Fort Wayne develop new directions in the problem solving area.

I commend the City for pursuing the implementation of the "cubettes" program and I urge you to take whatever steps are necessary to implement the program at the earliest possible date.

Sincerely yours,



Bruce T. Yoder, AIP
President, Indiana Chapter, American Institute of Planners
Vice President, Beckman Yoder and Seay, Inc.

BTY:rlid

ccs: Ronald Bonar, Fort Wayne Board of Works
David R. Vervalin, Fort Wayne Department of Urban Affairs

The Indiana Municipal Electric Association



*To Foster and Advance the Art and Science of Production, Distribution
and Use of Electric Current for Heat, Light and Power for Public Service.*

32 S. Eighth Street
Richmond, In 47374
April 24, 1972

Hon. Ivan A. Lebamoff
Mayor of the City of Fort Wayne
City-County Building
One Main Street
Fort Wayne, In 46802

Dear Mayor Lebamoff:

The Indiana Municipal Electric Association has voted unanimously at a special members' meeting, held April 20, 1972, to authorize me to inform you that we will provide you with our encouragement and assistance wherever and whenever possible in connection with your use of recycled municipal waste materials in your city-owned electric generating plant.

We are greatly impressed with your imaginative and environmentally acceptable methods for providing reliable, low cost energy to your consumers by utilizing, to the greatest possible degree, your existing units.

You will be able to compensate for higher coal costs through the use of the energy values inherent in municipal and industrial waste which cannot otherwise be salvaged as useful material resources. Also, we are certain that you will receive these further advantages:

- stack emission quality enhancement by utilizing this low sulfur, low contaminant salvage fuel.
- improve your fuels availability by recognizing that this new salvage fuel is locally derived and is generated every day.
- useful disposition of solid wastes in such a way as to prolong the life of diminishing land areas suitable for landfill.

Your efforts and accomplishments in this undertaking will be observed by us with great interest since we are also burdened with similar problems which need viable solutions.

Respectfully yours,

Irving Huffman

Irving Huffman, President

TH/wl



member

member
YANKEE-DIXIE
POWER, INC.

sponsor
AMERICAN MUNICIPAL
POWER-OHIO, INC.

co-operating
associate



Ohio Municipal Electric Association

Incorporated

OWERS LUSE, Exec. Secretary
119 East Water Street
North Baltimore, Ohio 45872
Ph. 419 257-7893

GEORGE CROSBY, President
Municipal Electric Dept.
919 South Main Street
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Ph. 513 773-6699

KENNETH HEGEMANN, Vice President
Municipal Utilities
101 East Spring Street
St. Marys, Ohio 45885
Ph. 419 394-3303

LYLE WRIGHT, Treasurer
Municipal Utilities
515 East Wooster Street
Bowling Green, Ohio 43402
Ph. 419 353-5443

April 24, 1972

Mayor Ivan A. Lebamoff
Fort Wayne, Indiana 46802

Dear Mayor Lebamoff:

The Ohio Municipal Electric Association, with 86 electric systems, took unanimous action last week in support of your developmental work in the utilization of pelletized municipal waste as a fuel "adder" in your steam plant.

These are our reasons for wishing to encourage your pioneering work in this area:

1. It will enhance the ability of your city plant to provide reliable low cost electric energy for your city power consumers.
2. It will assist you in making a maximum use of your plant investment.
3. It will enable you to compensate for the rising cost of coal.
4. You will be utilizing those segments of municipal waste that have little or no value otherwise.
5. You are apparently going to be able to enhance the quality of your stack emissions.
6. You can contribute to the solution of the national (and world) fuel crises by utilizing a locally derived fuel source that is, of course, generated continually.
7. You will help to prolong the life of our diminishing areas suitable for acceptable landfill projects.
8. Your efforts and accomplishments in this undertaking will be observed by us, by the nation's 2000 municipal power systems - and by the entire electric industry with tremendous interest.

For all these reasons we will provide our encouragement and assistance whenever and wherever possible.

Respectfully yours,

George Crosby III, President

GC/wl

MICHIGAN MUNICIPAL ELECTRIC ASSOCIATION

818 COWLEY AVENUE
EAST LANSING, MICHIGAN 48823
PHONE 517 351-6469

May 1, 1972

Hon. Ivan A. Lebamoff
Mayor
City of Fort Wayne
Fort Wayne, Indiana

Dear Mayor Lebamoff,

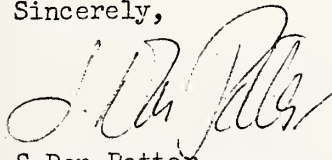
The membership of the Michigan Municipal Electric Association has asked me to convey to you our appreciation for your hospitality during the recent Tri-State Municipal Electric Convention.

We were especially impressed by the efforts made by your municipal electric operation to provide the quality of service your people have the right to expect.

The use of waste as a partial fuel is especially interesting, and we do hope that you will proceed with this program. There is a severe energy crisis in the United States, and certainly your efforts may point a way toward a solution.

Our members unanimously agree that Fort Wayne's program is of great value, and we offer you our complete encouragement and any assistance and support that we may be able to give.

Sincerely,

A handwritten signature in dark ink, appearing to read "S. Don Potter", written in a cursive style.

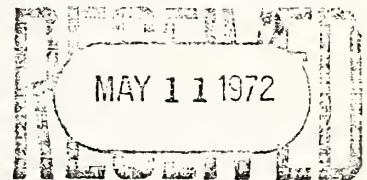
S. Don Potter
Executive Secretary

AMERICAN PUBLIC POWER ASSOCIATION

2600 VIRGINIA AVENUE NW WASHINGTON DC 20037 • 202/333-9200

May 5, 1972

BOARD OF PUBLIC WORKS



The Honorable Ivan A. Lebamoff
Mayor
City of Fort Wayne
One Main Street
Fort Wayne, Indiana 46802

Dear Mayor Lebamoff:

We have been made aware, through the paper presented by Newell F. Cunningham at the Tri-State Municipal Electric Conference at Fort Wayne April 20, of the promising program being undertaken by your City to burn compacted solid waste as boiler fuel in your municipal electric power plant.

An article based on Mr. Cunningham's talk appears in the March-April issue of Public Power, the bi-monthly journal of our Association, which is circulated to officials of each of the 2,000 municipal and other local publicly owned electric utilities in the United States.

As you may know, APPA was organized in 1940 as the national trade association of local publicly owned electric utilities. Based on more than 30 years of representing the interests of electric utilities similar to Fort Wayne's, we can state with some enthusiasm our reaction to the attempt of your utility to alleviate both fuel and waste disposal problems.

Our member utilities have reported to us with increasing frequency their concern over the rapidly rising price and the frequent shortages in supply of fuel. Similarly, they are confronted with the problem of every city, that of growing amounts of solid waste and fewer avenues for its disposal.

President, DURWOOD W. HILL
President-elect, MICHAEL F. COLLINS
Vice President, EDWARD E. COBB
Treasurer, WALTER R. WOIRDL
General Counsel, NORTHCUIT ELY
General Manager, ALEX RADIN

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Superintendent
Electric Department
Danville, Virginia
EARL F. BRUSH
Assistant General Manager
Board of Water and Light
Lansing, Michigan
STANLEY R. CASE
Director of Utilities
Fort Collins, Colorado
MARVIN CASTLEBERRY
General Manager
City Utilities
Springfield, Missouri
EDWARD E. COBB
General Manager
Huntsville Utilities
Huntsville, Alabama
MICHAEL F. COLLINS
Manager

Municipal Light Department
Wakefield, Massachusetts
FELIX COROJOVA DIAZ
Executive Director
San Juan, Puerto Rico
F.D. DIEHL
General Manager
Water & Electric Department
McPherson, Kansas
C.C. HARGIS
Manager
Utilities System
Lafayette, Louisiana

DURWOOD W. HILL
General Manager
Nebraska Public Power District
Columbus, Nebraska
W.G. HULBERT, Jr.
Manager
PUD #1 of Snohomish County
Everett, Washington

ALAN H. JONES
General Manager
Water & Light Department
McMinnville, Oregon
EDGAR L. KANOUSE
General Manager and Chief Engineer
Department of Water and Power
Los Angeles, California

JOHN R. KELLY
Director of Public Utilities
Gainesville, Florida
C.M. MATHEWS
Manager
Greenwood Utilities
Greenwood, Mississippi

R.A. MUENCH, Jr.
Administrator
Public Works Commission
Fayetteville, North Carolina
JOHN M. NELSON
Superintendent
Department of Lighting
Seattle, Washington

LEE E. NICKELSON
Chief Utilities Engineer
City Water, Light and Power
Springfield, Illinois
NORBERT D. RHINERSON
Manager
Electric and Water Department
Kaukauna, Wisconsin

W.J. SCHLAGEL
Director
Electric Utility
Ames, Iowa
V.G. SCOGGIN
General Manager
Nashville Electric Service
Nashville, Tennessee

JAMES D. SHERFEY
General Manager
Electric System
Bristol, Tennessee
WILLIAM A. STEBBINS
Superintendent
Electric Light Department
Burlington, Vermont

LOUIS STROUP
Executive Director
Kansas Municipal Utilities
McPherson, Kansas
Ex Officio
DONALD R. VON RAESFELD
City Manager
Santa Clara, California

WALTER R. WOIRDL
Treasurer
PUD #1 of Chelan County
Wenatchee, Washington

The Honorable Ivan A. Lebamoff

May 5, 1972

Page Two

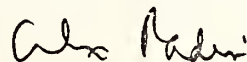
Therefore, the method being developed in Fort Wayne to dispose of solid waste through burning much of it as a low-sulfur boiler fuel supplement appears to promise significant economic benefits for your utility and its consumers, and significant social benefits for the citizens of Fort Wayne, in the disposal of solid wastes.

The potential of your program appears great enough to warrant an extensive evaluation and measurement program to demonstrate its possible application in other instances. If the technology can be demonstrated to be effective and proves to be as promising as it appears at this stage, it may have application for many similarly situated cities.

You can be assured that we will be following the progress of your important venture with the hope that it provides answers for many other member utilities of APPA to their dual problem of fuel cost and availability and solid waste disposal.

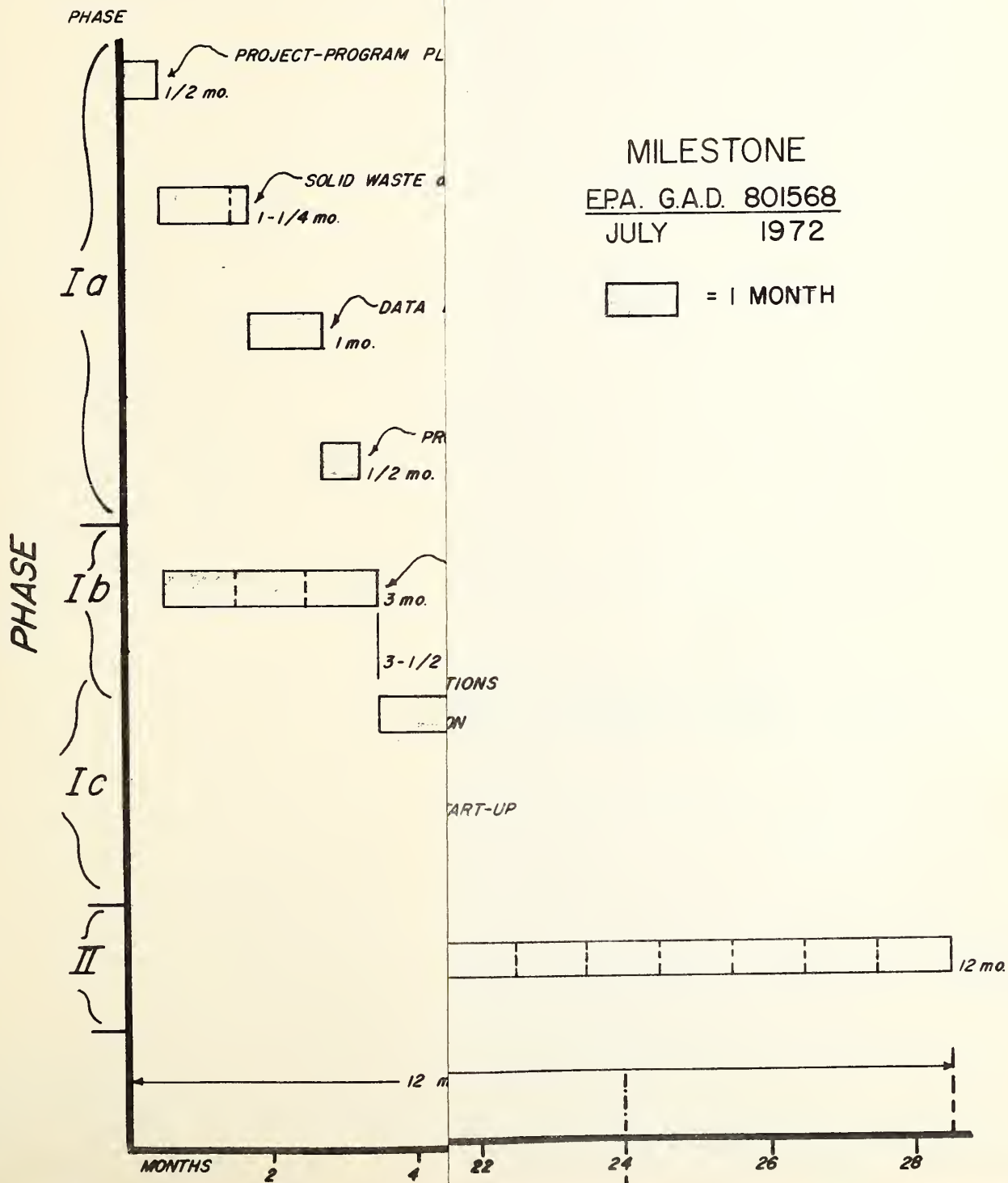
APPA has valued the membership of Fort Wayne's municipal electric system in the Association for many years and we look forward to many more years of mutually productive relation. You and your associates are to be congratulated for this innovative, forward-looking experiment.

Sincerely,



Alex Radin

AR/csv

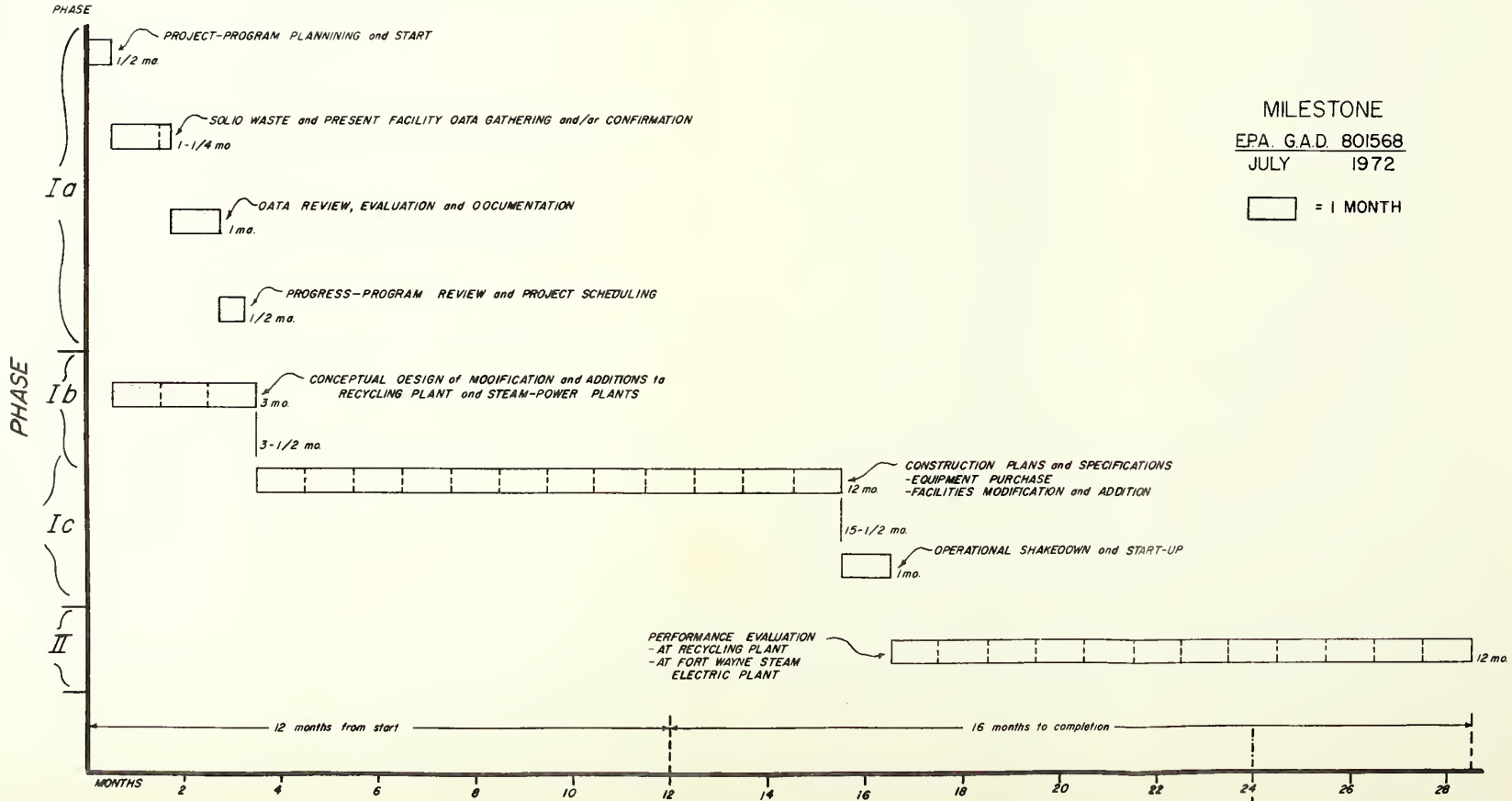


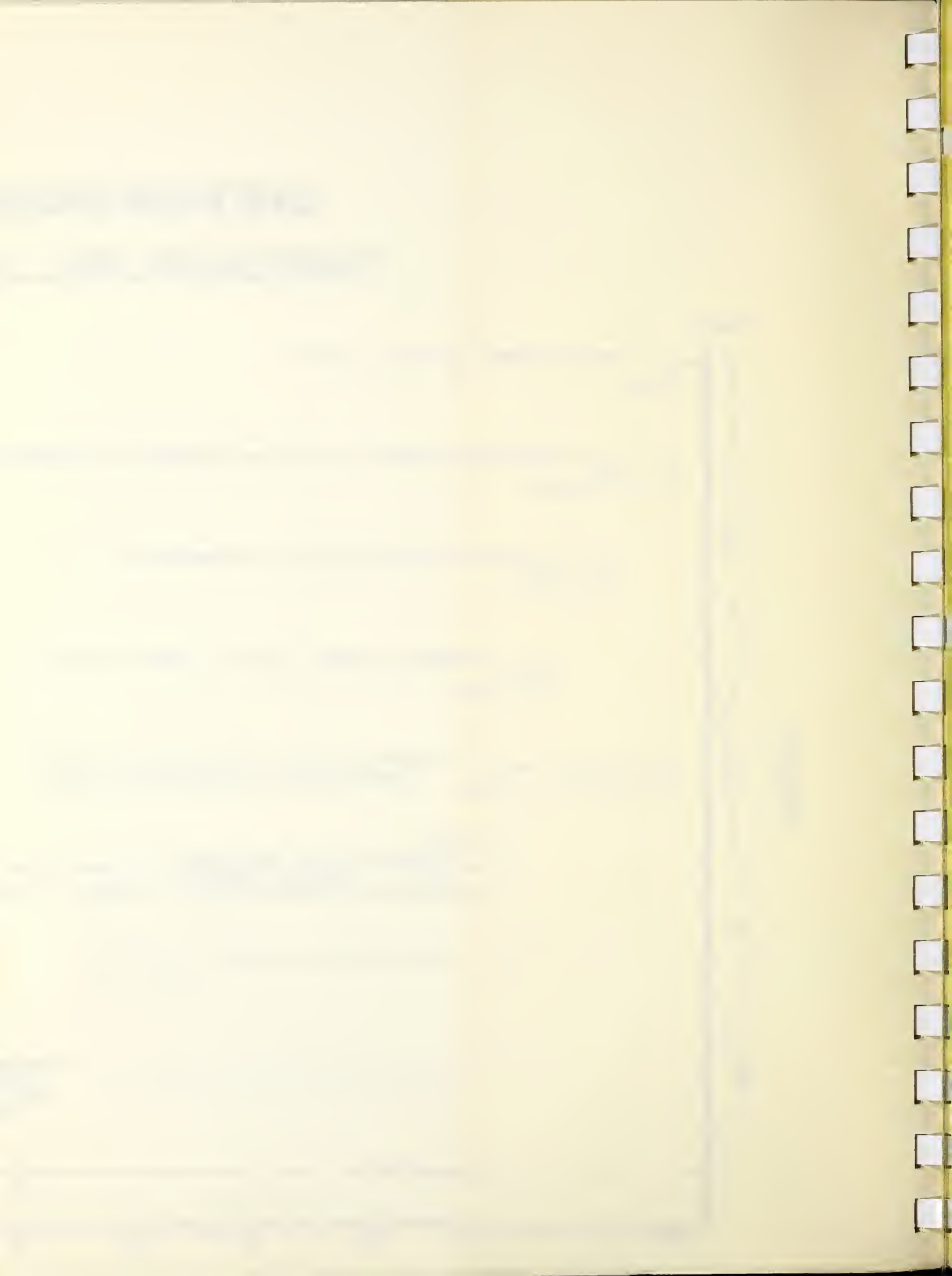
MILESTONE
EPA. G.A.D. 801568
JULY 1972

□ = 1 MONTH

CITY OF FORT WAYNE - Indiana

"CUBETTES AS FUEL" PROJECT TIME PHASE DIAGRAM





EVALUATION OF •

Solid Waste Cubettes
As Salvage Fuel For
Municipal Electric
Generation

City of Fort Wayne
Indiana



ROY F. WESTON, INC.
ENVIRONMENTAL SCIENTISTS AND ENGINEERS





ROY F. WESTON

ENVIRONMENTAL SCIENTISTS AND ENGINEERS
LEWIS LANE ■ WEST CHESTER ■ PENNSYLVANIA

3 September 1971

REPLY TO
LEWIS LANE
WEST CHESTER
PENNSYLVANIA 19380
215-692-3030
TELEX NUMBER: 83-5348
CABLE ADDRESS: RFWINC

CITY OF FORT WAYNE
Department of Public Works
City - County Building
Fort Wayne, Indiana 46802

Attention: Mr. Ron Bonar - Acting City Engineer

Dear Mr. Bonar:

As suggested, we have reviewed the letter to you of August 9, 1971 from Mr. J. Robert Holloway, Project Officer, Processing and Recovery Branch, Division of Demonstration Operations, U.S. EPA - O.S.W.M.P., Cincinnati.

Mr. Holloway is referring to a transmittal by Mr. William Kehr, their Chicago Regional Representative, who was kind enough to submit the Fort Wayne evaluation report draft of May 17, 1971 on the utilization of the Community solid wastes as beneficiated salvage fuel for your municipal steam-electric plant.

Mr. Holloway's letter reveals that there is an apparent misconception regarding the degree of similarity between the system proposed by Fort Wayne and the EPA demonstration project initiated with the City of St. Louis. Although both programs will recover the thermal energy in municipal wastes by generating steam, the St. Louis project encompasses "suspension burning" of shredded refuse as only one-tenth the fuel energy input requirement, the balance being powdered coal or gas. The only constituent removed from the solid waste will be the ferrous metals.

The Greater Fort Wayne program will incorporate a processing system separating, in addition to the ferrous metals, much of the other constituents having "negative fuel value" such as glass, ceramics, non-ferrous metals, stone and dirt, etc. The processing system will also recover that cellulose fiber stock fraction of solid waste suitable for recycle to the paper and board mills.

THE BENEFICIATED SALVAGE FUEL SEGMENT WILL BE IN THE FORM OF COMPRESSED CUBES APPROXIMATELY 1-1/2" DIMENSIONALLY. These salvage fuel cubettes will be burned "quiescently" on a conventional stoker grate inter-mixed (ratio 1:3 or greater) with lump coal. The beneficiated solid waste salvage fuel cubette quality will be controlled within narrower limits than heretofore accomplished or attempted with Community wastes.



ROY F. WESTON

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

Mr. Ron Bonar

-2-

3 September 1971

Of the many benefits inherent in this Greater Fort Wayne progressive solid waste management program, those which have significant national implications are:

- conversion of the relegated combustible fraction of the waste stream into a controlled quality salvage fuel with physical characteristics necessary to permit amenable handling and prolonged storage to afford practical consumption on an "as fuel needed" basis.
- lower thermal energy costs through use of this beneficiated salvage fuel would
 - permit continued and extended use of existing stoker-fired steam (power) plants
 - provide investment justification for modernization of air pollution control systems
- incentives provided to the private sector, (in particular the secondary materials industry), for further commitment to assist in coping with the burgeoning solid waste problem
- the husbanding of our natural resources - fossil fuels - ferrous and non-ferrous raw materials - cellulose fibers.

Therefore, the Greater Fort Wayne multi-thrust program for solid waste management has much broader ramifications and applications than the St. Louis project.

The final draft of the Greater Fort Wayne report dated August 30, 1971 provides an exhibit of the materials flow system and briefly describes and illustrates in the Appendix the different types of stoker designs and typical installations which might take advantage of this new locally derived fuel source.

We believe the above discussion in conjunction with the expanded material in the August 30 report will clarify any misunderstanding and reveal the beneficial contribution of the Fort Wayne program to solid waste management.

Yours very truly,

Herbert I. Hollander, P.E.

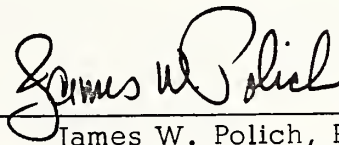
Principal Consultant

Waste/Energy Conversion Systems

HHH:lp

CITY OF FORT WAYNE, INDIANA

Preliminary Evaluation
of
COMMUNITY SOLID WASTES UTILIZED
AS SALVAGE FUEL CUBETTES
FOR MUNICIPAL ELECTRIC GENERATION



James W. Polich, P.E.
Project Manager



Herbert I. Hollander, P.E.
Principal Consultant
Waste/Energy Conversion Systems

RFW 468-09
August 30, 1971

Prepared By
ROY F. WESTON
Environmental Scientists and Engineers
Edens Executive Center
Wilmette, Illinois 60091
312/256-4310



ROY F. WESTON

ENVIRONMENTAL SCIENTISTS AND ENGINEERS
LEWIS LANE ■ WEST CHESTER ■ PENNSYLVANIA

REPLY TO
LEWIS LANE
WEST CHESTER
PENNSYLVANIA 19380
215-692-3030
TELEX NUMBER 83-5348
CABLE ADDRESS RFWINC

30 August 1971

CITY OF FORT WAYNE
Department of Public Works
City - County Building
Fort Wayne, Indiana 46802

Attention: Mr. Fred S. Ehrman - Chairman

Dear Mr. Ehrman:

We transmit herewith the ROY F. WESTON report on our review and preliminary evaluation of the feasibility for salvaging those segments of the Community's solid wastes (having little current commercial value) as a "cubetted" fuel component of the input thermal energy for your municipal steam-electric generating plant.

We have concluded from our review that the approach developed by the CITY OF FORT WAYNE and the National Recycling Corporation is technologically viable and can provide several significant benefits to the Community.

Since this approach has "national significance" in demonstrating a practical innovative system for solid waste management, material and thermal resource recovery and the husbanding of our natural resources, we recommend and urge the CITY OF FORT WAYNE to apply for a grant under the Federal Resource Recovery Act of 1970.

Yours very truly,

Herbert I. Hollander, P.E.
Principal Consultant
Waste/Energy Conversion Systems

HIH:lp

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APPENDIX A

Review of solid fuel firing equipment, implications on stack emissions and illustrations of typical applications.

PERSPECTIVE

The increasing public awareness of environmental degradation and its potential impact on the ecology of our biosphere is compelling the reassessment of all current disposal methods for the wastes of society.

Coupled with this concern is the growing realization that many of the wastes of yesterday may have to be the material and energy resources of tomorrow.

It has been reported recently that in the past 30 years the United States alone has used more of the fuel and mineral riches of the earth -- the only source -- than all of mankind did in all of previous history.

Our land areas are now also being recognized as a precious resource. With the growth of our population and their corresponding sustenance needs, the exploitation of land for wastes disposal, as previously practiced, will have to give way to more judicious use. The available land areas suitable for burial of "unprocessed" wastes are diminishing rapidly and becoming more remote.

In the broad time framework, burial of wastes can be considered to be only a temporary expedient; since time for biodegradation is an indeterminate variable, the filled land area is relegated to restricted use for generations to come. Perhaps, in efforts to use the land for their civilization, the American Society of the 21st century may find many of the spoils of today during excavation for foundations for their structures.

There is much evidence of the inadequate previous approaches to solid waste disposal by incineration as well as the futile attempts at composting as THE panacea.

Resolution of the solid waste disposal problem continues to intensify --- waiting for this elusive panacea.

The energy crises of 1970 and the significantly higher fuel costs endured ever since then, have brought into sharp focus that our needs for energy will severely tax our traditional types and sources of fuel as well as the realization that nuclear fueled electric energy to satisfy our needs is still on the horizon.

The principle of resource recovery or recycle has been discovered anew by the public. This concept has probably been practiced in varying degrees since the time of Adam. The "by-product" evolves from the wastes of production and consumption. Many of today's products were "by-products" or waste products of yesterday.

The present awareness has highlighted the need for broader-based methods and systems for resource recovery and in time by-product development.

An essential element for realization of a technically and commercially viable system is the recognition that 100% materials resource recovery may not be practical or realistic, and, therefore, the success of the system should not be burdened with this visionary goal. Only those elements in the wastes of industry and the community which can be readily scalped from the mass and have significant "current" material value should be pursued. The remainder should be processed into an innocuous state or buried in a manner which would not limit the future use of the land filled.

There are numerous industrial installations using production wastes as a "recovered" resource; many times just as a fuel resource for steam generation or other forms of thermal energy conversion.

Previous attempts to utilize mixed municipal refuse (as delivered), as a fuel for steam (power generation), have been burdened by its broad variability in physical and chemical character as well as the material in-flow rate.

Several new approaches are underway in this country and overseas attempting to utilize mixed municipal refuse as a fuel. Some of these are attempting to apply the techniques developed by industry to utilize their wastes and no doubt will enjoy a measure of success.

Although wastes from industrial production can be very different from one installation to another they usually all have one basic element in common. When compared to the variability found in municipal wastes, the production wastes of industry are reasonably predictable in their physical and chemical nature at any one plant or one utilization system. The performance of refuse fuel burning systems are materially enhanced if the fuel segment salvaged from refuse can be processed to make it reliably predictable in regard to its physical and chemical properties.

The City of Fort Wayne, in concert with the management of the City Utilities Power Plant, upon investigation, have generally concluded that it is feasible within present technological limits, by proper design and operation of a materials salvage and refuse fuel preparation facility, to realize significant benefits from the wastes of the Community:

- substantial material resource recovery
- substantial thermal energy resource recovery
- prolong the useful life of existing landfill areas
- utilize the landfill areas in a manner to provide minimum constraints on its use by future generations
- prolong the fossil fuel resources of the region
- reactivate and prolong the useful life of the older *mass-burning stoker fired steam (electric) generating units
- avoid or minimize all forms of environmental degradation.

The City of Fort Wayne believes this approach to be realistic; one which draws upon available technology applied innovatively, while cognizant of the practical, environmental, technical, economic and management flexibility and constraints which exist or might evolve.

ROY F. WESTON has reviewed the concept and the various elements involved, concurs in this assessment and, therefore, recommends that the main thrust of the FORT WAYNE approach be to utilize as a "processed fuel" that fraction of municipal and industrial wastes considered not worthy of materials salvage with the basic objectives of:

- recovering those material resource elements having values which can currently be realistically obtained, with provision for future extension
- modifying within practical limits the remaining fraction of the wastes to permit utilization as a fuel . . . affording:
 - . . .controlled physical size and density
 - . . .controlled moisture content
 - . . .controlled inerts content
 - . . .faculty for simple handling, storage and reclamation
- demonstrating that their existing municipal steam-electric station equipped with mass-burning coal stokers could be rejuvenated and with minor modifications accommodate this new fuel source; this could prolong the useful life of the older generating facilities by improving the cost of electric production

- demonstrating that this type of burning "lump" fuels has the characteristic of very low particulate entrainment, and that the "cubetted" fuels (see Exhibit) emanating from the materials resource recovery facility would have little if any of the burdensome constituents such as metals, glass, ceramics, dirt, etc., accompanying the delivered municipal waste.
- determining the economic value of "cubetted", "sorted" refuse as a fuel and thereby the extent of potential support or incentive to the secondary materials industry to invest and operate facilities for this aspect of resource recovery.
- demonstrating that the life of the land areas used as a depository can be materially extended.
- demonstrating that only those materials which have no significant material or thermal recovery value would be buried in the land; and that such materials would be substantially inert and therefore not limiting the future potential use of the receiving land area.

BACKGROUND

General

The City of Fort Wayne, Indiana, and particularly the management of the City Utilities Power Plant have been investigating for several years the various methods for conversion of solid wastes to energy, as represented by existing European installations and pilot-plant projects within the United States.

The present public concern over ecology and our diminishing natural resources has forced a reassessment of refuse disposal methods including incineration for several reasons:

- 1) Controlled combustion of solid wastes as a fuel offers an opportunity for heat recovery with steam (power) generation where appropriate;
- 2) A properly designed waste conversion complex offers an opportunity to recover a portion of our materials resources by salvaging metals, glass and "select" paper prior to conversion as a fuel;

- 3) Controlled combustion offers the opportunity to reduce the total amount of materials to be disposed of in a landfill and consequently, the amount of land necessary for ultimate disposal;
- 4) The inert nature of the residues from combustion permits more rapid and diverse use of reclaimed filled land areas.

The City of Fort Wayne believes that within present technological limits, it is feasible to provide for both materials resource and thermal energy recovery by the proper design and operation of separation facilities for material resource values and the subsequent utilization of the remaining materials as salvage fuel energy in their electric power generation plant.

Toward this end, the City of Fort Wayne initiated preliminary trials burning "cubetted", "sorted" solid waste materials in the existing City Utilities Power Plant, and subsequently retained ROY F. WESTON, environmental scientists and consulting engineers to review the concept practicality and assess the expectations.

Municipal Utility Facilities

The City of Fort Wayne has had an electrical generating franchise for many years. Over these years, the City has developed a utility that at one time supplied 60% of the electrical needs of the Greater Fort Wayne area (see Exhibit - D,E,F,G). The present power plant consists of four mass burning coal fired steam generators operating at 385 psig, 700°F, serving turbine-generators with a total name plate capacity of 40,000 Kilowatts. A new 200,000 pounds steam per hour gas and oil fired boiler will be put into service late 1971; a new gas turbine-generator has been recently installed to further increase station capacity. Nevertheless, the power plant is not modern, and by present day standards, low pressure and temperature, and therefore considered thermally inefficient.

Present Solid Wastes Management

Solid wastes collection within the City of Fort Wayne is by contract. The current contract (6 years) commencing January, 1971, has been awarded to National Serv-All Company, Fort Wayne, to provide once-a-week pick-up of residential solid wastes and putrescibles from commercial food establishments within the City limits. National Serv-All also provides for disposal of these collected materials by operating a landfill on their land.

The refuse from suburban Fort Wayne and the industrial establishments are collected and disposed of by several private firms within the area. Until recently, most of the solid wastes collected were disposed of in landfills located relatively close to the City. Suitable land areas for such disposal operations have become almost impossible to find reasonably close to the City, and where available, too expensive to obtain.

About 5 years ago, one of these collection/disposal firms, the Fort Wayne Reduction Company (now National Recycling Corporation--see Exhibit - H,I,J) constructed a "Teepee" incinerator in conjunction with a paper salvage operation. Due to more stringent air pollution control regulations and inefficient burning, the Teepee incinerator was shut down. National Recycling has replaced this burning operation with more automated salvage facilities which can process some 30 tons per hour of solid wastes, recovering selected paper and metal. There remains a low materials value fraction containing plastic, wood, and paper, which was believed to be a possible fuel substitute.

Preliminary Investigations

National Recycling initiated discussions with the municipal power plant management to determine if in some way this refuse segment could be used successfully as a fuel. After some investigation, it was decided to undertake preliminary trials; National Recycling arranging to form into cubettes the material remaining after the materials salvage operations. Thirty-seven tons of this combustible refuse segment were ultimately formed into cubettes (see Exhibit L) and burning trials were conducted on two separate occasions in the municipal power plant (with no modifications to the equipment).

The results of these preliminary investigations were very encouraging; indicating that the "refuse fuel cubettes" could be consumed in the existing stoker fired boilers. Two calorimetric analyses indicated these cubettes could provide 6850 to 8530 BTU per pound (air dried basis). With the 3 to 1 coal to "cubette" ratios burned there were no apparent operating difficulties with the equipment, in fact the composite fuel bed seemed to be more "free burning".

No apparent difference in stack gas emissions (particulate or opacity) was detectable. This was based on a visual comparison without benefit of stack sampling.

PRELIMINARY PROGRAM

The City of Fort Wayne, and National Recycling, believe that this approach can be expanded to include a significant portion of the City's solid wastes. Preliminary discussions in this regard have led National Recycling to expand their materials recovery facilities and a commitment to the City to invest in suitable cubetting equipment. The City of Fort Wayne has also committed their support to this project by retaining consulting engineers to provide the preliminary technical study for adapting or modifying the power plant's fuel handling system, fuel firing, and steam generators to take advantage of this new locally derived fuel source. The contemplated program was to initially utilize 50 tons of cubettes per day, so as to reliably demonstrate over an extended period of time the feasibility of burning the cubetted salvaged combustible fraction of solid wastes, with coal, in the municipal power plant. It is expected this would replace 25% of the present fuel weight requirements for the existing steam generators. Modifications to the power plant's existing fuel handling system, when completed, would permit up to 100% utilization of cubettes should this prove to be desirable. If current expectations of performance and economics are realized, installation is contemplated of a new larger steam generator incorporating the optimized design parameters and elements determined during the evaluation of this demonstration program.

It is the belief of the City of Fort Wayne and National Recycling that this project would provide a dual thrust for resource recovery--once the marketable reclaimed materials (metals, glass, paper) have been extracted, the remaining portion of the solid waste stream (primarily paper, plastics, wood and cloth) would be converted into fuel cubettes with its thermal energy values recovered in the generation of steam for electric power in lieu of ending up in a landfill (see Exhibit K).

ROY F. WESTON concurs in this belief, and, based on a review of those preliminary trials conducted by the City of Fort Wayne and National Recycling, it is recommended that the City of Fort Wayne apply for a demonstration grant under Section 207 of the Resource Recovery Act of 1970. Since a program of this nature should be feasible for many communities, and the proposed project will be developed on a County-wide basis, it is believed that the project should qualify for a 75% grant. The objectives of the proposed project, which are detailed in the following paragraphs, meet all the guidelines as set out in Sections 207 and 209.

PROJECT JUSTIFICATION

In terms of national implications for solid wastes management, ROY F. WESTON believes this project provides a unique opportunity to demonstrate on a regional basis, the technical and economic feasibility of municipalities salvaging the thermal energy resources in their solid wastes stream, in their own plants, in that of institutions or even industry. The project would demonstrate:

- 1) the extent to which existing "conventional" stoker fired steam generators,* with some modification, can operate with suitably prepared refuse of the Community as a component of the input fuel energy;
- 2) the degree and nature of stack emissions from burning composite coal/solid waste fuels as compared with 100% coal firing;
- 3) the economics of generating steam using a composite coal/solid waste fuel;
- 4) the extent of support or incentive available to the secondary materials industry to invest and operate facilities for salvaging from the wastes of the Community that fraction which can be processed into cubettes suitable as a reliable fuel.

Another factor that should be investigated is the technical and economic feasibility of modifying existing steam plants to operate with up to 100% prepared refuse as an energy source.

There are approximately 260 steam generation units with a total capacity of 16 million pounds steam per hour in city or state facilities similar to Fort Wayne's power generation system. There are many industrial installations which might also find a suitably prepared, local derived salvage fuel attractive for their use. Most of these installations generate steam at relatively low pressure and temperature. There are few installations which generate steam as high as 900 psig, 900°F.

Once it has been demonstrated over an extended period that utilization of refuse salvage rejects prepared as a reliable fuel source is practical and feasible, projections should be made of the optimum scope and size of the fuel utilization system as well as of the cubetting operation to provide the desired reliability, uniformity and least cost.

Discussions with State of Indiana personnel with respect to the merits of such an approach has generated considerable interest as can be seen from Exhibit A,B,C. A recently issued publication* of US-EPA-OSWMP discusses the need for demonstration projects such as that recommended herein for Greater Fort Wayne. The Conclusions from this EPA publication are noteworthy in that the basic goals outlined earlier in this Section are identical to those major points presented in the EPA report Conclusions. This Conclusion section, Chapter VII, Pages 95 and 96 are included as Exhibit N.

SPECIFIC PROJECT OBJECTIVES

The specific objectives of the demonstration project should be as follows:

- 1) Determine over an extended period the predictable BTU values available from that refuse portion salvaged for use as a fuel. Although the technical feasibility of the project has been demonstrated through prior experimentation, more data is needed on the actual variations in BTU, moisture and sulfur values for the cubettes. Extended operating experience data is needed of the power generation facility using various percentages of cubettes as a fuel supplement. This project would demonstrate whether the cubette BTU levels can be maintained within prescribed limits, on a sustained basis to provide the City with predictable continuous source of locally-derived fuel for its steam generation needs.
- 2) Determine the effect of burning combined coal/waste fuel cubettes on the stack gases of the existing power plant. This addition of essentially sulfur free fuel should reduce total sulfur emissions. The project would also demonstrate whether the levels of particulate emissions using this composite fuel will in fact be no more, and probably less, than that now experienced using 100% coal.

*Recovery and Utilization of Municipal Solid Waste, U.S. EPA, Office of Solid Waste Management Program, SW-10c, 1971.

IMPLEMENTATION PROGRAM

To implement this program, it is recommended that the City of Fort Wayne:

Award a contract to a consulting engineering firm conversant with municipal-industrial solid waste management, refuse fuel burning, air pollution control, combustion engineering, and steam power generation;

- to determine the quantities and characteristics of the wastes generated in the region to be served; that fraction of the wastes which would be the basis for the fuel cubettes; the modifications to the steam-electric station to accommodate this salvage fuel
- to prepare engineering drawings and specifications for the modifications and additions
- to supervise the field construction and put the equipment into service
- to assist in compilation of the necessary data to evaluate system performance and value obtained from this salvage fuel utilization concept

Make an arrangement with National Recycling Corporation to provide the prepared cubetted salvage fuel from the wastes of the Community;

Award a contract to a professional firm to assist in the analysis and determination of the stack emissions during the testing and evaluation periods;

Apply for a demonstration grant under Section 208 of the Resource Recovery Act of 1970.

Toward this end, a preliminary scope-of-work has been developed outlining those steps necessary to complete the proposed project.

PROJECT SCOPE-OF-WORK

PHASE Ia - Data Gathering

Fort Wayne, Indiana, is the County seat of Allen County and is situated in the Northeastern quadrant of the State. The 1970 census figures indicate that the City of Fort Wayne has a current population of approximately 177,000, while the Greater Fort Wayne area has approximately 240,000 people. Allen County has approximately 270,000 people.

Industrial development in and around Fort Wayne is quite extensive.

No data are available on the solid wastes generation factors either on a per capita basis or from the industrial sector. Using an assumed per capita generation factor of 3.75 pounds per capita per day, the quantities of municipal solid wastes in the region would be:

	<u>1970 Population</u>	<u>Estimated Municipal Solid Wastes</u>
City of Fort Wayne	177,000	332 tons per day
Greater Fort Wayne Area	240,000	450 tons per day
Allen County	270,000	506 tons per day

An estimate of the industrial solid waste generation in Allen County is approximately 450 tons per day.

It is anticipated that the work scope for PHASE Ia would be the development of quantities and characterization of those Community solid wastes which will be processed in PHASE II. This would include the determination of per capita factors for waste generation and the weight percent of its various elements. This information would then be utilized to project: quantities of materials to be salvaged; the composite make-up of the resultant salvage fuel cubettes; an estimate of energy values and proximate analysis of fuel cubettes; the potential impact of such cubettes on steam generator operation and stack emissions; and, the necessary testing and evaluation procedures for full-scale studies.

The data developed as part of PHASE Ia would be beneficial in that it would provide a technical basis for a future County-wide planning program, and is necessary as a valid basis for confirming the technical and economic feasibility of a materials salvage and fuel cubetting operation.

PHASE Ib - Conceptual Design

Concurrent with PHASE Ia, engineering studies would be initiated:

- to review the existing fuel handling systems, etc.
- to develop a conceptual design for an effective, flexible handling-storage-feeding system for the composite coal/salvage cubette fuels;

"For controlled combustion and equilibrium conditions in a stoker fired furnace, it is necessary to maintain a uniform fuel bed on the grates to afford uniform permeability for combustion air flow. This would require uniformly introduced fuels which are consistently predictable from the standpoints of specific weight, size consist, "burnability" and energy release. These circumstances are attainable within reasonable limits if control flexibility is provided in the handling, storage, feeding, and burning equipment.

To provide a uniformly mixed - coal/cubette-composite fuel, provisions must be made to accommodate their different characteristics; the flow characteristics of the less dense salvage fuel cubettes (one half that of coal) and the greater storage volume required for an equivalent weight of coal. For equivalent steam production approximately twice the weight or approximately four times the volume of coal would be required."

- to study the design and operation of the selected steam generators to determine what modifications if any are required to the furnaces, convection banks, heat traps, collection hoppers, and ash handling, to accommodate the selected coal/salvage fuel ratios.

- to study the present provisions and anticipated requirements for control, monitoring and recording of:

flows: steam; feed water; coal; salvage fuel cubette; combustion air (undergrate and overfire); and flue gas.

pressure: steam, water, combustion air streams

draft: exit gas at furnace, boiler, economizer, air heater, dust collector and induced draft fan.

temperature: steam, feedwater, preheated combustion air; exit gas at furnace, boiler, economizer, air heater, and dust collector.

- to study the present provisions and anticipated requirements for control of stack emissions (i.e., recording of opacity, CO₂, O₂ and sampling for SO_x, NO_x, Cl and particulate) when burning each of the composite coal/salvage fuel ratios as well as when burning coal only.

PHASE Ic - Facilities Modifications

PHASE Ic would involve the construction of the modifications to the existing power plant facilities as developed in PHASE Ib to permit operation on a consistent controlled basis.

Expansion of the salvage/cubetting system of National Recycle Corporation would be financed wholly by National Recycling Corporation. National Recycling has also agreed to maintain specific cost data on waste handling and separation, cubette preparation, savings at landfill operations resulting from cubette fuel utilization and income from salvaged materials, as supplemental input to the project. The final accounting procedures to be implemented should be determined with guidelines resulting from consultations with EPA-OSWMP.

PHASE II - Performance Evaluation

PHASE II would involve the operation and monitoring of the system for a period of one (1) year.

The specific goals of PHASE II would be to:

- 1) Determine the technical and economic feasibility of segregating that portion of the Community's solid wastes that cannot currently be recycled; and establish the nature of preparation necessary for its utilization as a "predictable" fuel for steam generation.
- 2) Demonstrate that the useful economic life of existing stoker fired boilers can be extended by using cubetted solid wastes as a fuel source; determine the extent to which prepared salvage fuel cubettes may be used in existing facilities--in composite fuel ratios up to 100% refuse fuel, i.e., 0%, 25%, 50%, 75%, 100%.

Prior to the three (3) week test data gathering and performance evaluation period for EACH composite fuel ratio approximately three (3) weeks of operation is anticipated to establish discrete procedures, equipment adjustment and calibration, so as to reasonably assure the desired steady state test conditions.

- 3) Determine during each test/evaluation operating day a proximate fuel analysis including sulfur and chloride content of a representative coal and cubette sample. Bottom ash and fly-ash analyses would also be made each day to determine the carbon, chloride and sulfur content, and the total residue weight.
- 4) Determine magnitude and nature of deposits on boiler tubes and metal wastage potential by monitoring the condition of at least six (6) new and old tubes, to be strategically located in the steam generator. This investigation aspect will be coordinated with the on-going research program on metal wastage EPA-OR&M, Contact No. EP00325-03.
- 5) Determine the effect on stack particulate and gaseous emissions when using the programmed ratios of composite coal/refuse fuel cubettes and relate to that when burning coal only.
- 6) Determine the KW production cost saving (if any) when using combination coal and solid waste fuels.

When considering the total economics of the project, the savings accrued due to lesser landfill operations, subsequent extension in existing landfill life, and extended utilization of existing generation facilities would be taken into account, the parameters to be used will be established in conjunction with EPA-OSWMP.

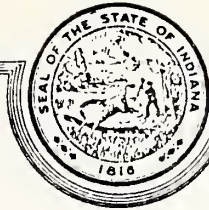
- 7) Determine the "availability" of the system by maintaining a rigorous log on all outages with detailed accounts on those (if any) which can be attributed to the salvage fuel utilization aspect.
- 8) Project the size and design from both an operational and economic standpoint for an optimum processing facility and salvage fuel cubette fired steam generating units.

"Although usually in good condition with many years of useful life remaining, the turbine-generators in some of the older power stations are used only for peaking load conditions or emergencies. These units are smaller, lower pressure and temperature and therefore command a higher heat rate (BTU/kw) than the more modern large central station units installed in recent years. However, if the wastes of the Community can be suitably prepared to permit its utilization as a dependable energy source, this locally derived, low sulfur fuel may justify extended use of the existing equipment and perhaps even warrant installation of new optimized steam generators replacing several modest sized boiler units which ordinarily do not hold their "youth" as well as turbine-generators. Modern, larger steam generators to serve existing turbine plants might also provide additional economies in maintenance and manpower requirements."

- 9) Project the experiences gained from this program for possible applications in other communities.

A preliminary Project Phase Diagram (see Exhibit M) has been prepared to delineate those phases anticipated as necessary to complete the scope-of-work.

STATE OF INDIANA



INDIANAPOLIS 46206

AIR POLLUTION CONTROL BOARD
1330 WEST MICHIGAN STREET

~~633-4467~~ 633-4420

July 1, 1971

Hon. J. Edward Roush
United States Congress
2400 Rayburn Building
Washington, D. C. 20515

Dear Congressman Roush:

Re: City Utilities Plant
Fort Wayne, Indiana

In response to your inquiry of June 21, 1971, regarding correction of conditions at the Fort Wayne Utilities plant, I wish to report that smoke may continue for sometime. A new gas-fired boiler, to replace the load on three coal-fired boilers, will be installed soon. However, because of the shortage of gas as an energy source, its planned use to correct this problem may be limited to operation in warm weather only when residential gas demands are low.

Total correction of this problem now hinges on the City of Fort Wayne's efforts to utilize the burnable portion of its municipally-collected wastes as a specially prepared pelletized fuel. This will be mixed with their coal to improve burning conditions to eliminate smoke and sulfur dioxide, reduce fuel costs, and minimize waste disposal costs. I am interested in this approach as a solution to these problems as well as a possible solution to a solid waste problem and the general fuel shortage problem.

The City of Fort Wayne has requested financial assistance from the Environmental Protection Agency to ascertain the feasibility of this program. Since you represent the Fort Wayne area, you may wish to follow this application for release of Federal funds.

Very truly yours,

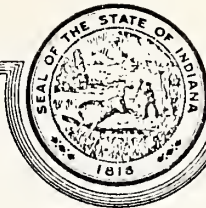
Perry E. Miller
Technical Secretary

ML01son/se

cc: Hon. Harold S. Zeis, Mayor
City of Fort Wayne

EXHIBIT A

STATE OF INDIANA



INDIANAPOLIS 46206

AIR POLLUTION CONTROL BOARD
1330 WEST MICHIGAN STREET

~~633-4420~~ 633-4420

July 8, 1971

RECEIVED

JUL 12 1971

Mr. Ronald L. Bonar
City-County Building
1 Main Street
Fort Wayne, Indiana 46802

Water Pollution Control Engr. Dept.
City-County Building, One Main St.
Ft. Wayne, Indiana 46802

Dear Mr. Bonar:

Re: Fort Wayne Demonstration Project on
Pelletized Solid Wastes as Fuel for
Power Generation

This will inform you that the Divisions of Air Pollution Control and Sanitary Engineering of the State Board of Health endorse the City of Fort Wayne's project on "Evaluation of Pelletized Solid Wastes as Salvage Fuel for Municipal Electric Generation."

At the June 8, 1971, conference in Fort Wayne, attended by representatives of the City of Fort Wayne, the Federal Environmental Protection Agency, National Recycling Corporation and the State Board of Health, emphasis was placed on the need for recycling solid wastes as part of our waste disposal program, the need for additional fuel supplies for our economy, and the need to control air and water pollution. Utilizing underfeed stoker-type boilers throughout the country, for municipalities, institutions and even those for industry, may solve or help solve all three needs. This demonstration project could prove this concept.

We do not at this time have a list of facilities throughout Indiana that would be similar to the Fort Wayne generating plant which would enable them to utilize this type of fuel. There are without doubt 100 or more boilers with underfeed stokers, including some that have recently been converted to using gas or placed in standby service for economic reasons. For example, one company located near Fort Wayne manufactures corrugated paper stocks. They may possibly purchase raw materials from National Recycling Corporation. They burn 200 tons of coal per day with an underfeed stoker.

Of interest to you, also, is the enclosed listing of electric generating plants within Indiana. Most of the smaller plants listed are equipped with underfeed or chain grate stokers although some likely use spreader stokers that would require efficient flyash collectors.

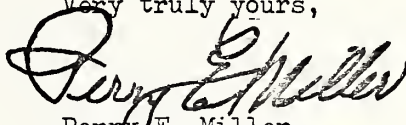
EXHIBIT B

Mr. Ronald L. Bonar

July 8, 1971

Enclosed also is a copy of a recent newspaper article on automotive waste crank case oil disposal. Visualize what effect the use of this would have on the Btu value of this pelletized fuel and on the solution of another important waste disposal problem.

Very truly yours,



Perry E. Miller
Technical Secretary

MLOlson/cw

Enclosures

cc: Mr. Fred S. Ehrman, Chairman
Fort Wayne Dept. of Public Works
Mr. Edward Law, President
National Recycling Corporation



STATE OF INDIANA
OFFICE OF THE GOVERNOR
INDIANAPOLIS



EDGAR D. WHITCOMB
GOVERNOR

August 26, 1971

The Honorable Harold S. Zeis
Mayor
City-County Building
Ft. Wayne, Indiana

Dear Mayor Zeis:

It has recently come to my attention that the City of Fort Wayne is evaluating the feasibility of burning municipal solid waste in its existing electrical generation plant. It is also my understanding that the process under evaluation includes the recovery, and salvage of various components from these municipal wastes prior to burning.

The City of Fort Wayne is to be commended in its attempt to utilize its community's waste in a beneficial way and to solve some of our more serious resource problems. I endorse the ultimate objectives of this demonstration project and wish you every success.

Sincerely,

Edgar D. Whitcomb
Edgar D. Whitcomb
GOVERNOR OF THE STATE
OF INDIANA

EDW:hb

FORT WAYNE MUNICIPAL ELECTRIC PLANT

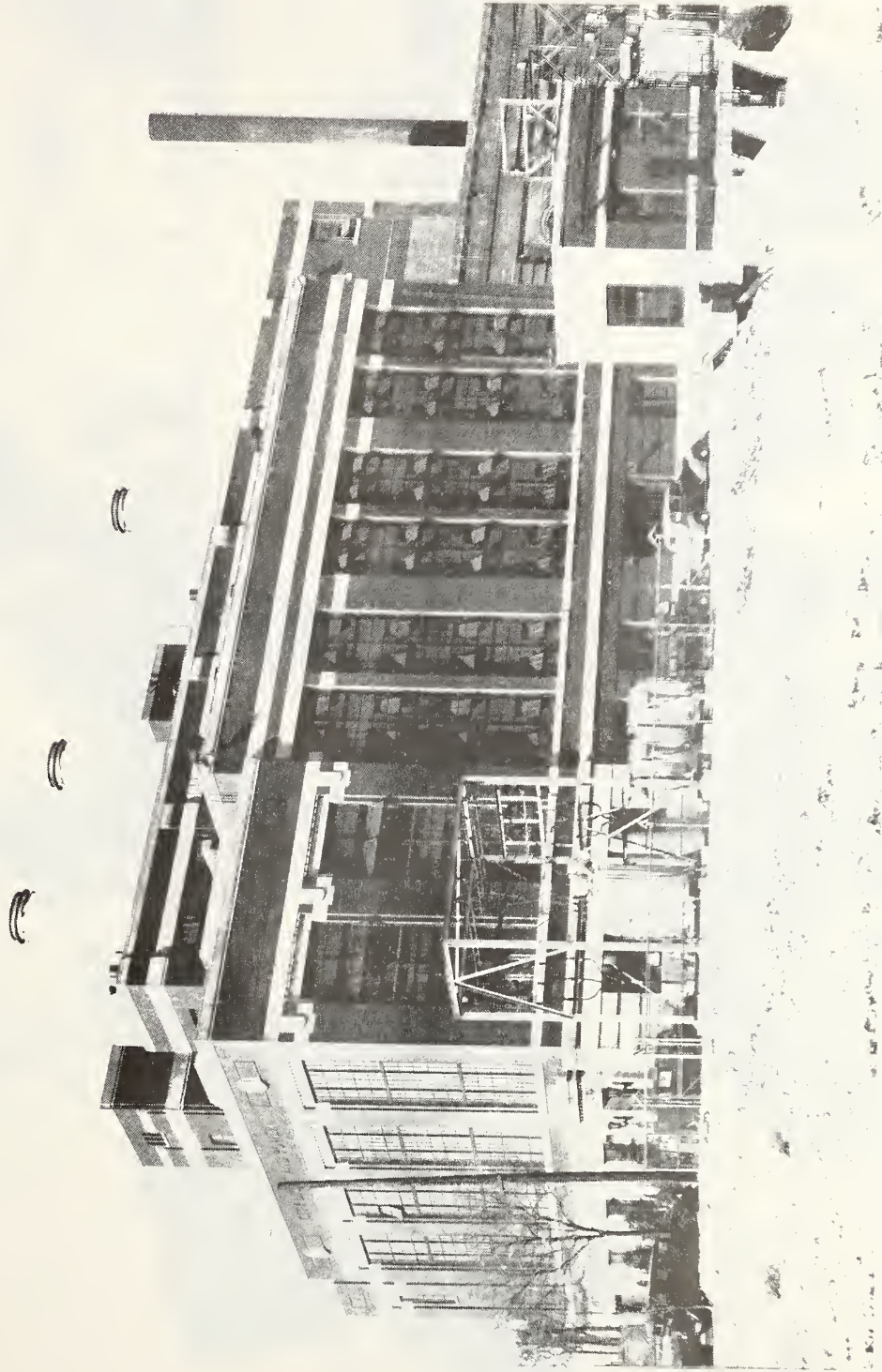


EXHIBIT D

ROY F. WESTON



ENVIRONMENTAL CONSULTANTS, INC.
LEWIS LANE • WEST CHESTER • PENNSYLVANIA • 19380

TURBINE-GENERATOR ROOM

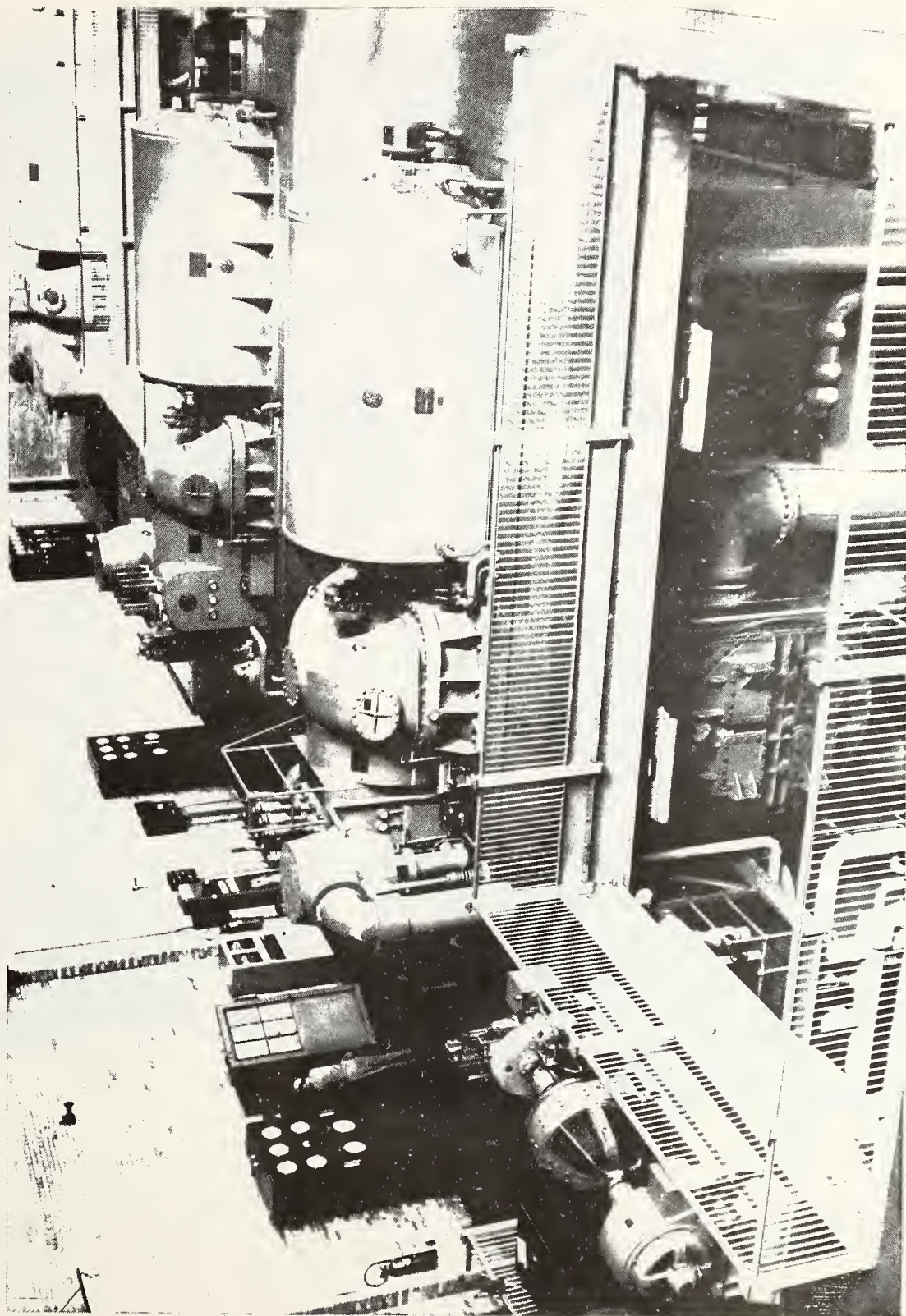


EXHIBIT E



ROY F. WESTON

ENVIRONMENTAL SCIENTISTS AND ENGINEERS
LEWIS LANE • WEST CHESTER • PENNSYLVANIA • 19380

BOILER-STOKER FIRING AISLE

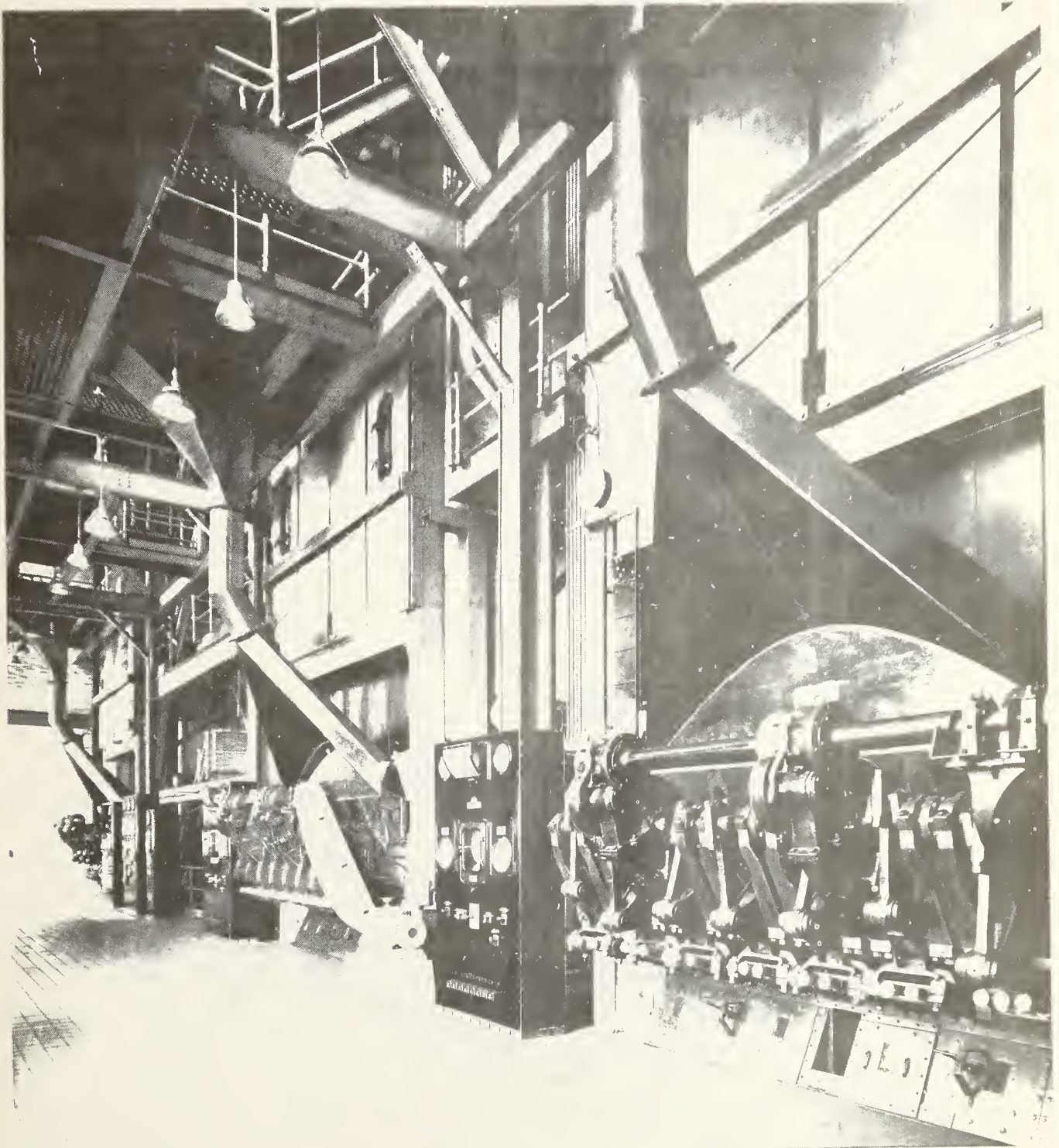


EXHIBIT F



ROY F. WESTON

ENVIRONMENTAL SCIENTISTS AND ENGINEERS
LEWIS LANE • WEST CHESTER • PENNSYLVANIA • 19380

SECTIONAL VIEWS OF STEAM GENERATORS TYPICAL OF FORT WAYNE UNITS

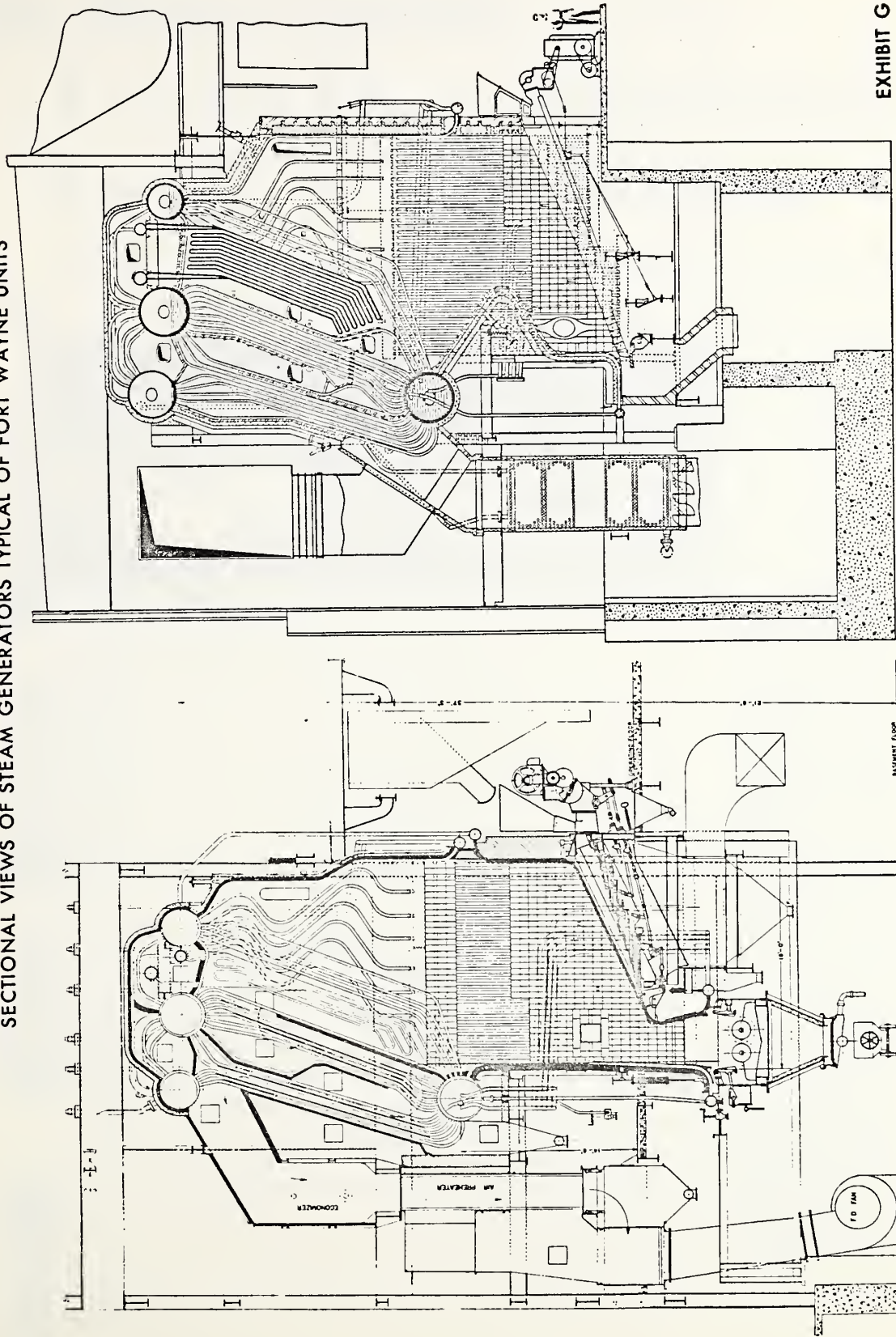


EXHIBIT G

ROY F. WESTON

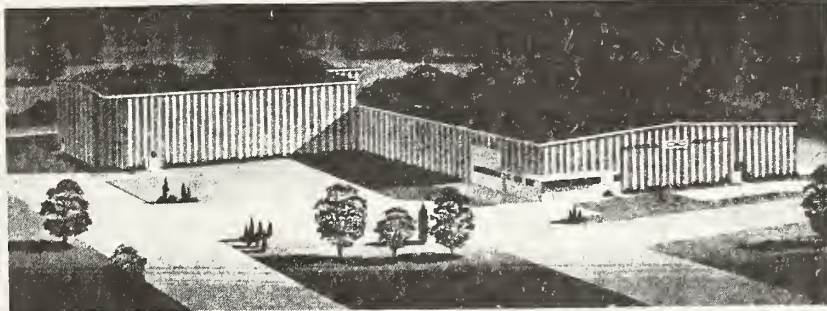


UNITED STATES GOVERNMENT
OFFICE OF THE SECRETARY OF THE ARMY
WASHINGTON, D. C.

First in News,

Teepee Days Numbered; Yields to Automation

Fort Wayne Reduction, Inc., today announced a major expansion and renovation program, along with a new corporate name reflecting the change. Edward Law, president, said the waste firm's name has been changed to National Recycling Corporation. Law, who came here from St. Paul, Minn., after being named the company's chief executive officer earlier this year, said the old "teepee" incinerator on Maumee Road is being replaced with an automated separation system to reclaim all re-useable materials from incoming waste. THE "TEEPEE" belched out the great quantities of smoke during its operation, and was objectionable to neighbors and conservationists. It was closed in August, with the structure now housing a compactor which reduces waste into a compact form, returning them to the economy, is now greatly improved.



IN OPERATION BY SPRING?—Expected to be in operation next Spring, National Recycling's new and expanded facilities will provide a growing response to the problems of waste disposal. Up to 90 per cent

of some types of waste will be recovered and turned back into the economy, saving both renewable and non-renewable resources.

Law said the old "teepee" will be torn down and replaced by two buildings making a new wing. The buildings will add 17,000 square feet to the 20,000 square feet completed earlier.

THE ADDITION will house the automated separation system, which will sort refuse and channel the different materials into compactors, reducing them in size for shipment to reprocessing manufacturers.

The separation operation is expected to be ready for use in March, 1971.

Under the previous process, Law said, the company was able to reclaim only about 20 per cent of the paper coming into the plant, with the remainder being burned.

"NOW, WE WILL recycle about 90 per cent of the paper, eliminating incineration altogether, along with the waste in the resources," he continued.

Reclamation of metals, principally steel and aluminum, will be even higher, he added.

Law said that in terms of the environment—in addition to pollution abatement—the recycling process eases pressure on timber cutting because, "every bale of paper we save also saves trees that would otherwise be cut to meet demands."

"EVERY TON of metal we save means a saving in virgin ores, the mining of which sometimes turns landscapes into moonscapes."

Law said the new process represents a step toward "closing the loop" of natural resources, keeping them in use instead of taking them from nature and abandoning them as pollutants.

He said "any presently irrecoverable material will be used in an environmentally compatible manner to restore marginal areas to economic usefulness."

National Recycling presently processes about 5,000 tons of waste a month, but this capacity will increase considerably when the teepee comes down and the new wing is completed, Law added.

The company officials said "even the tripling of waste recycling is only an interim goal; we'll constantly develop means to save more, and to increase the kinds of materials we can process."

"We are now able to recycle glass, and hopefully markets for this material can be increased," he added.

Materials now coming into the plant are composed of approximately 60 per cent paper, 10 per cent metal, 5 per cent glass, and the rest a mixture of wood, dirt and other materials.

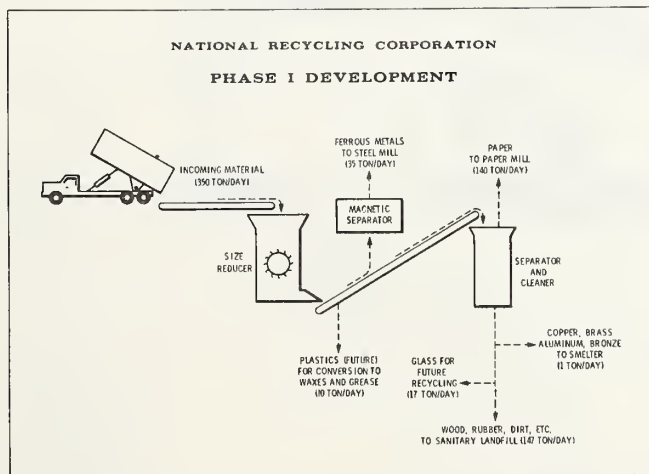
Law said National Recycling hopes to install similar plants in other areas of the country.

Read by 16,500 More Families in Met
FORT WAYNE, INDIANA, 46802, MON

ONLY 10 Cents
SATURDAY—15 Cents

Weather Data on Page 13A

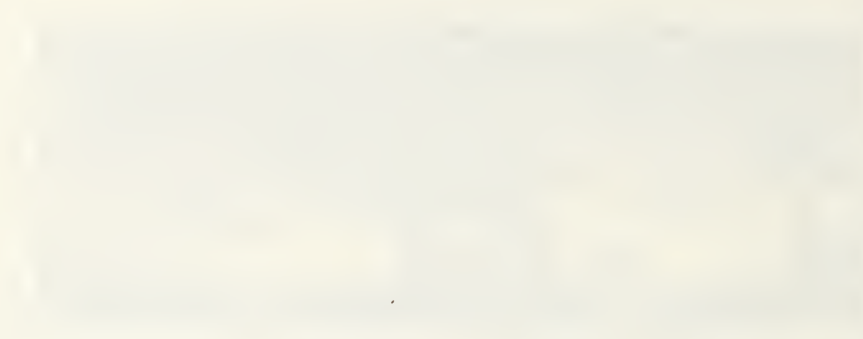
137TH YEAR—



Lettering - 1875

1875 - 1876

1876 - 1877



1877 - 1878

1878 - 1879

Reprinted from

2/71

Cities & Villages

OFFICIAL MONTHLY PUBLICATION OF THE OHIO MUNICIPAL LEAGUE

SOLID WASTE RECYCLING

NATIONAL Recycling Corporation, Fort Wayne, Indiana, has announced a major expansion and improvement program in the growing field of solid waste recycling, aimed at increasing the quantity, diversity and percentage of waste materials that can be recovered for reuse in the economy.

The firm, which has operated for several years as Fort Wayne Reduction, Inc., reports that construction is started on a 17,000 square foot plant addition; it will house an automated system for separating incoming mixtures of waste paper, ferrous and non-ferrous metals, glass, plastics, and other materials — channeling them to other equipment for compacting and shipment to manufacturers.

Previously, the company recovered only about 20 percent of the incoming wastes, the rest going up in smoke in an unpopular teepee burner. That process was terminated in August, 1970, as the newer and more efficient recovery systems became available, and as objections to environmental pollution increased.

Corporate president Edward Law now estimates recovery of reusable materials at about 70 percent. Irrecoverable and non-economic materials are landfilled, but the company indicates that both the scope and percentage of recycled materials will substantially increase upon completion of the new plant in March, 1971. The company's present 20,000 square foot plant houses systems for paper and metal reclamation.

At this time, most of the wastes handled are industrial, but Law adds that the company is now discussing

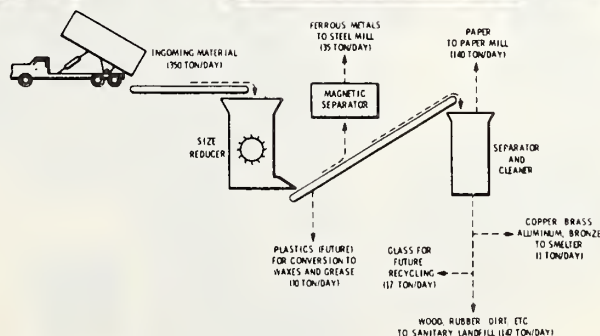
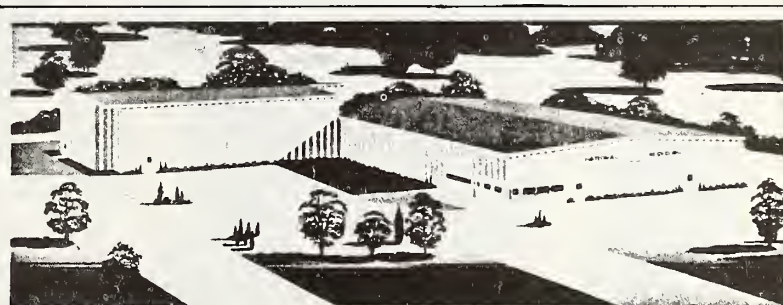
solid waste problems with a number of Midwestern municipalities. He said the company is able to install and operate compacting systems, landfills, and other refuse reclamation and disposal systems for municipalities.

Law attributes the acceptability and success of National Recycling's Fort Wayne operation to "almost universal public consciousness of diminishing non-renewable resources, and to public insistence that these resources be reused — instead of being consumed and discarded as environmental and visual pollution."

The idea, Law continued is "to close the loop in resources, so that they are kept in use as long as possible.

"Paper saved and reused saves trees and forests; metals recovered and reused reduces to an extent the mining pressures on the lands, and helps assure reliable supplies for industrial needs."

The company now processes about 5,000 tons of waste a month, including 60 percent paper, 10 percent metals, 5 percent glass, and the rest a mixture of wood, dirt, rubber and other materials.



The left wing is under construction, for completion in March, 1972, to house automated operator system. Right wing, already completed, houses systems for paper and metal reclamation.



NATIONAL RECYCLING CORPORATION FORT WAYNE PLANT

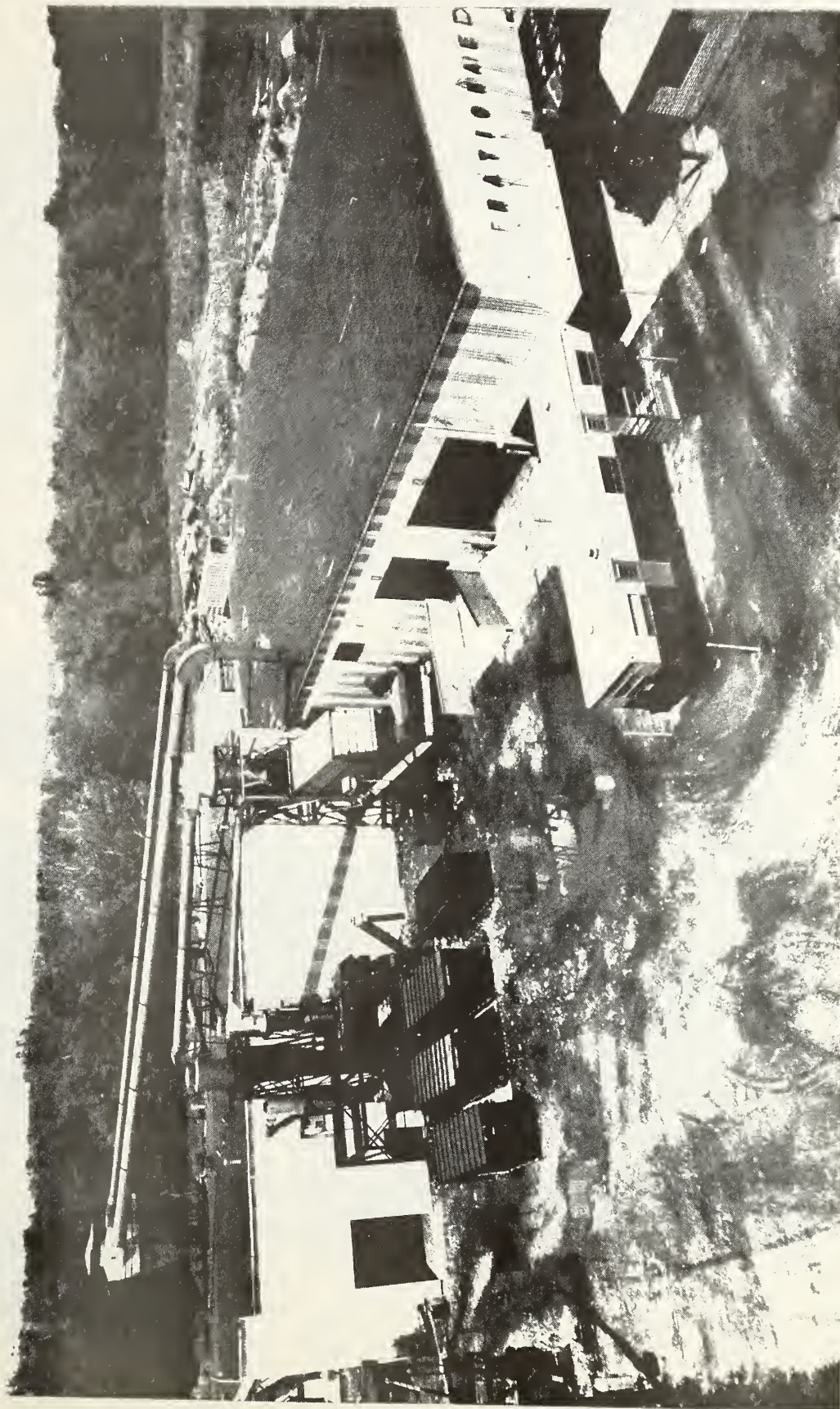


EXHIBIT I



ROY F. WESTON

ENVIRONMENTAL SCIENTISTS AND ENGINEERS
LEWIS LANE • WEST CHESTER • PENNSYLVANIA • 19380

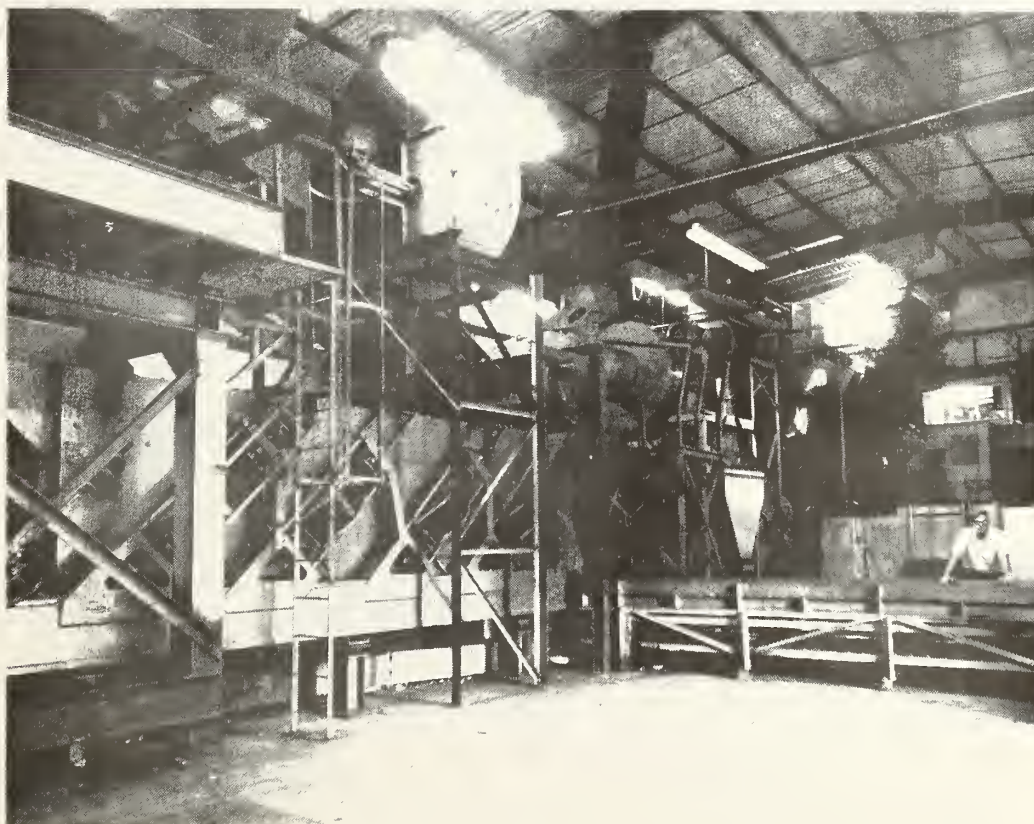
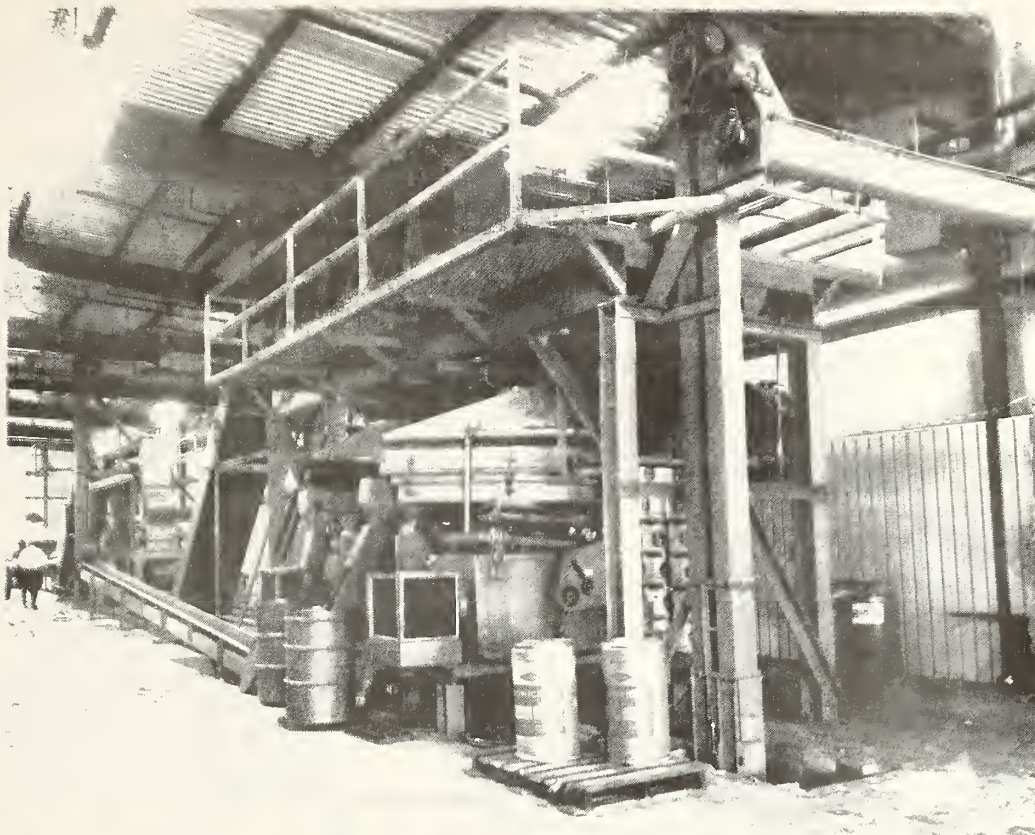


EXHIBIT J



ROY F. WESTON

ENVIRONMENTAL SCIENTISTS AND ENGINEERS
LEWIS LANE • WEST CHESTER • PENNSYLVANIA • 19380

TYPICAL MATERIALS FLOW DIAGRAM

OF THE

NATIONAL RECYCLING CORPORATION
FORT WAYNE PLANT

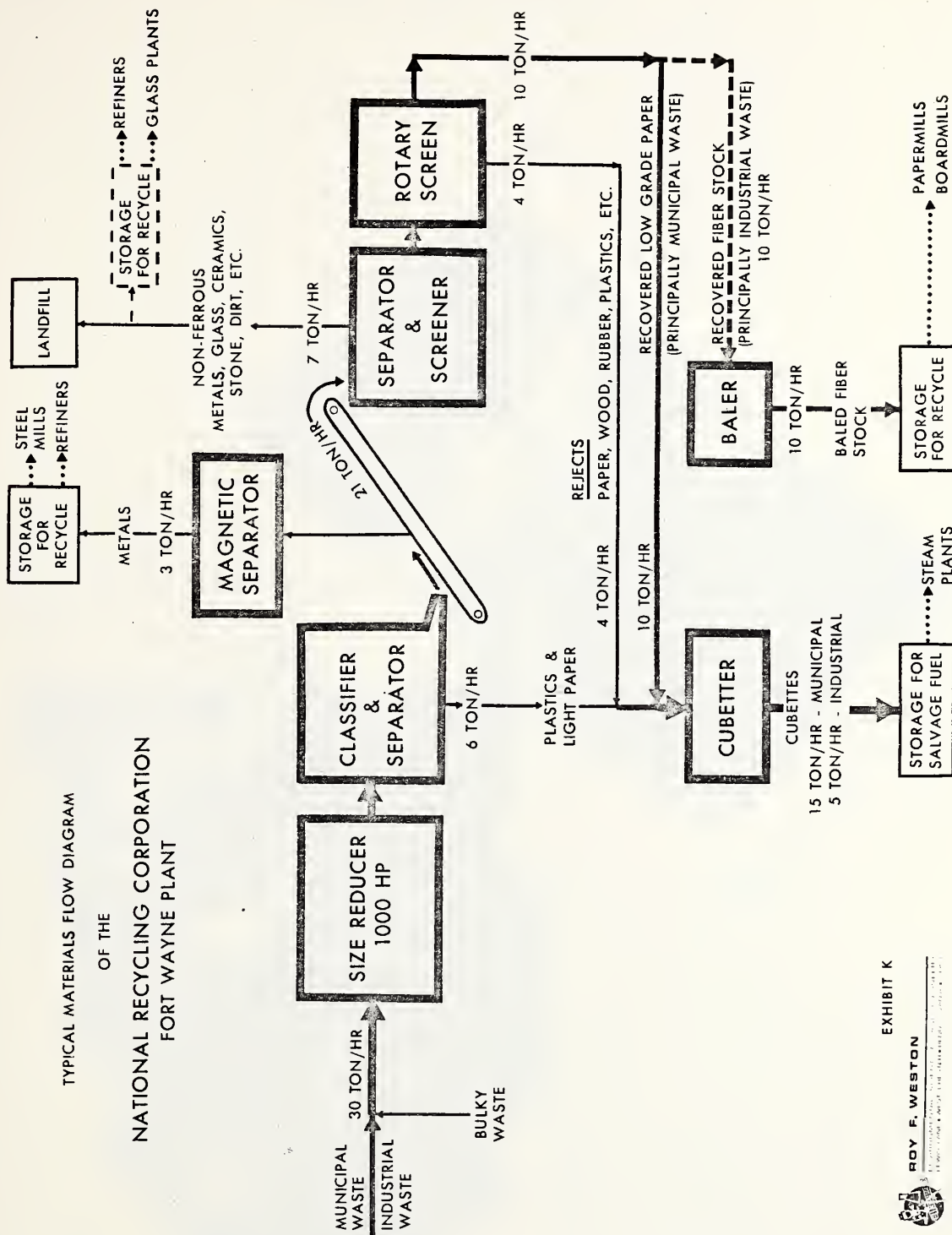


EXHIBIT K

ROY F. WESTON



CITY OF FORT WAYNE, INDIANA

SOLID WASTE CUBETTE

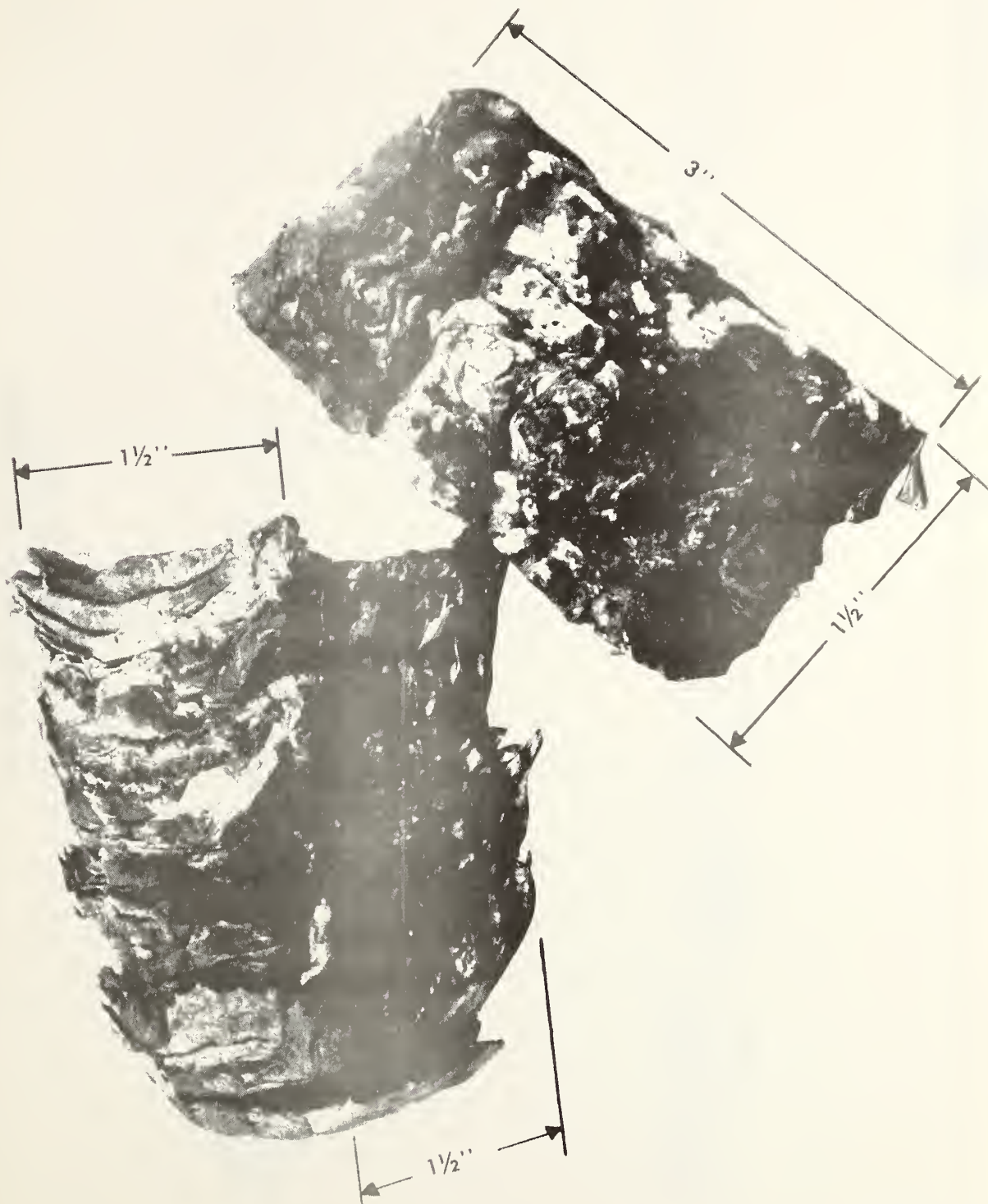


EXHIBIT L



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CITY OF FORT WAYNE, INDIANA
PROJECT PHASE DIAGRAM

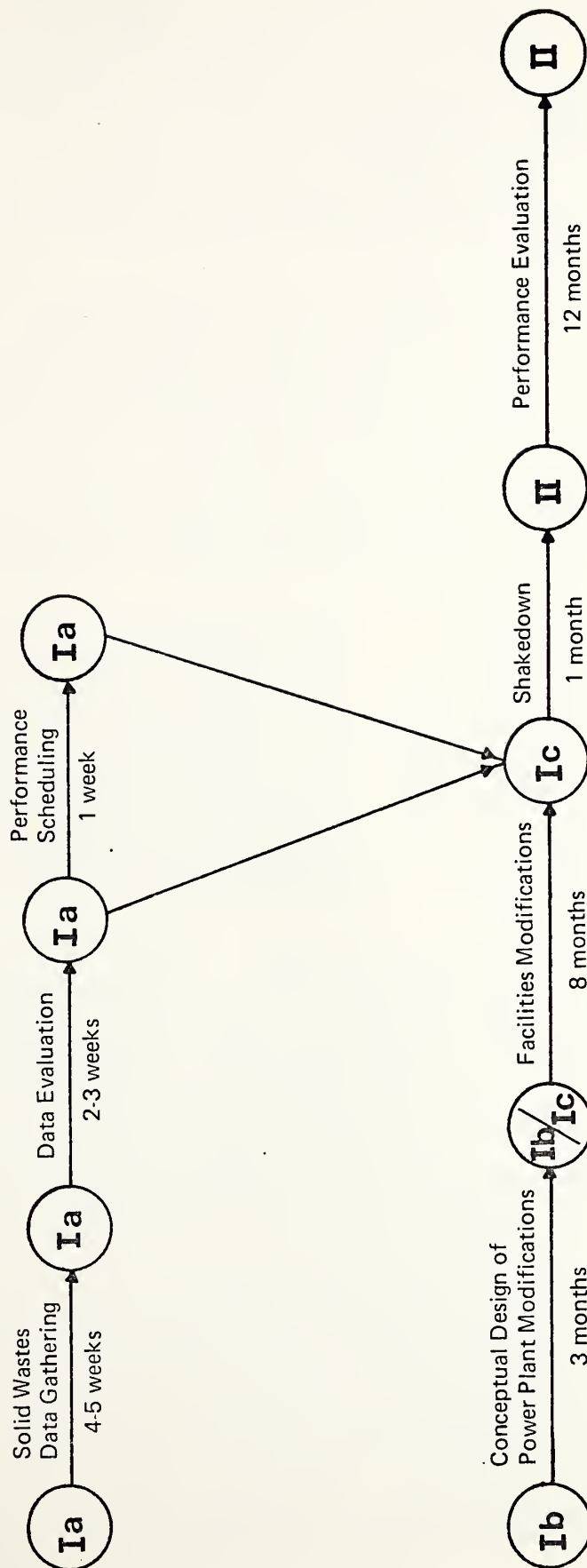


EXHIBIT M



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VII. Conclusions

UNIT PROCESSES AND RELATED COST AND PERFORMANCE DATA

RELIABLE AND MEANINGFUL cost and performance data on unit processes for the recovery and utilization of mixed municipal solid waste are not generally available from existing operations owing to: the limited applications of many equipment designs and processing techniques; the failure to collect meaningful data on the applications that do exist; and the proprietary nature of much of the available cost and performance data.

The only way for the Bureau of Solid Waste Management to obtain reliable and meaningful data on unit processes for the recovery and utilization of solid waste is to sponsor experimental studies and full-scale operations and to collect basic data in conjunction with such studies. Consequently, opportunities should be exercised at all existing solid waste demonstration projects to collect cost and performance data on the various unit processes employed, and to experiment with other equipment types not originally provided in the plant designs. Uniform cost-allocation standards and procedures should be developed so that data collected from various installations can be compared.

The analytical design of size-reduction and separation equipment for processing industrial materials is generally not possible due to the non-homogeneity of materials processed. Consequently, empirical studies are usually required to select equipment and operating conditions. The non-homogeneity of solid waste dictates a need for even greater reliance on experimental studies; extrapolation of cost and performance data collected for selected industrial applications cannot be expected to yield reliable

information for the design or evaluation of solid waste processing systems.

Although several wet and dry size-reduction equipment designs are suitable for processing solid waste for separation and recovery, the most versatile, in terms of material and particle size capability, is the hammermill. For processing waste streams not containing bulky materials, the rasp mill and drum pulverizer offer advantages. For high degree of size reduction (from very large to very small particles), a series of two or more stages of size reduction is more efficient than a single stage.

Except for handsorting and magnetic separation of tin cans and other ferrous materials, performance characteristics and associated costs for solid waste separation techniques are not well established.

BY-PRODUCT RECOVERY VERSUS SALVAGE

In the area of recovery and utilization of mixed solid waste, by-product recovery appears to have significantly greater economic potential in the classical sense than does salvage and should be given priority for research and development. There are three reasons for this: (1) The immediate and long-range market potential for the salvage of materials from solid waste appears to be unpromising, except perhaps for tin cans. The preliminary indications uncovered in this study, however, need to be explored in greater detail before a firm judgment can be made. (2) The high quality requirements for salvaged materials for reuse in manufacturing processes are beyond the economic and technical capabilities of existing and foreseeable separation technology. (3)

By-product recovery systems do not require a high degree of feed preparation, and it is anticipated that

processing requirements can, for the most part, be met by reasonably foreseeable extensions of existing separation technology.

The primary role of salvage in solid waste recovery should be an adjunct to a by-product recovery system if, for example, it is desirable to extract a given material in conjunction with manufacturing or upgrading of a given by-product. For reasons outlined above, salvage should not be made the primary function of a mixed solid waste processing and recovery system.

Technically, the most promising technique for increasing the overall salvage potential of solid waste is household separation of clean newspapers and other paper by far the largest single component in solid waste. Recovered paper has a definite market, and the long-range reuse and salvage potential is attractive, if a steady supply of clean materials can be guaranteed. It is likely, however, that advantages attributable to household separation will not be sufficient to justify disadvantages related to attempts to secure the public's cooperation. This is true because cellulose is not a critical resource; that is, modern forest management practices are capable of adequate replacement so that acute shortages of cellulose are not likely to develop.

ECONOMICS OF SOLID WASTE RECOVERY AND UTILIZATION

Throughout this report reference has been made to the economics of solid waste recovery. Based upon the information collected and the general trends observed during this study (and despite the fact that recovery of specialty items from municipal solid waste and the manufacture of specific products may prove to be economic for certain geographic areas or certain situations), it is concluded that the recovery and utilization of municipal

sions regarding recovery and reutilization of solid waste can be made. Thus, it is quite possible that landfill and conventional incineration (i.e., without by-product recovery) may become unattractive for solid waste management, not from the development of an economic (in the direct dollar cost sense) recovery process, but rather through increased dissatisfaction with associated undesirable side effects in the form of aesthetic offenses to the environment, resource depletion, and objectionable or harmful pollution of the land, air, and water resources.

Further evaluation of recovery and reuse of solid waste should include a systems analysis approach to the standard engineering costs potential of solid waste recovery. This approach would establish a priority of best, next best, etc., processes in a classical economic sense. One or more of the "best" processes (which may still prove to be uneconomical in the classical sense) could lead to a broader program, taking into account the less tangible costs associated with solid waste disposal in an attempt to justify recovery and reutilization of material.

Although it is not difficult to believe that social-cost considerations will rather than classical economics will determine future directions in solid waste management, implementation of these considerations will be difficult. The major problem is the definition and measurement of the various social costs, once they have been identified. This is essential in order to provide decision criteria to municipal and other government officials who are committed, to a large extent, to least-cost alternatives (in terms of direct dollar expenses) in the disbursement of public funds. Consequently, it appears that significant technical and public relations effort is required, aimed at defining the magnitude and long-term effects of disposal-oriented solid waste management practices.

solid waste may never become generally economic in the classical sense. This is because transportation and processing costs are likely to be so high that products recovered or manufactured from solid waste will cost more than their conventionally manufactured counterpart or, alternatively, the process must operate at a loss to compete in an open market.

Even if the above situation should prove to be the case, development of techniques directed toward the recovery of material from solid waste must continue to be explored. This is because motivation for solid waste recovery may be provided by the growing awareness and concern about the external diseconomies and social costs associated with the classical disposal-oriented methods of solid waste management. We are rapidly moving into a society in this country where, in areas such as pollution control, direct dollar costs are no longer the sole consideration. For example, the full costs of air pollution from burning refuse whether in dumps or in most modern incinerators have not yet been accurately measured. Similarly, the social costs of a landfill operation (which can be positive or negative) or of an incinerator operation cannot be readily determined. Still more important, perhaps, is consideration of external diseconomies such as resource depletion. Although some materials, such as cellulose, are converted by disposal-oriented practices to basic constituents (such as carbon dioxide and water) and thus enter a natural cycle culminating in the growth of timber, other materials, such as metals and their oxides, can be lost irretrievably to future generations through present solid waste disposal practices.

Battelle believes that all the "costs" of solid waste disposal, including the social as well as economic costs of pollution and considerations regarding resources management, must be evaluated before comprehensive deci-

Source: Recovery and Utilization of Municipal Solid Waste, U.S. EPA, Solid Waste Management Office, Publication SW-10c, 1971.

APPENDIX

APPENDIX

The first applications of mechanical stokers for burning solid fuels was in the early 1800's. These embryo installations employed the fundamental principals on which most modern stokers are based. The design objectives of the different types of stokers are:

- to continuously (or intermittently) feed fuel uniformly onto a grate surface within a furnace arranged to provide and maintain ignition.
- to proportion the required undergrate combustion air flow to suit the respective stages of energy release in progress on or within the grate system.
- to clean the fuel bed by removing the ash residue from the furnace zone.

The basic stoker designs can be designated as:

- mass burning
 - fuel overfeed type
 - fuel underfeed type
- thin burning (semi-suspension)
 - fuel spreader type

Schematic stoker illustrations are shown in Figures 1, 2, and 3. Detailed descriptions of the mechanisms, operation, fuel selection, burning characteristics are described in the literature - some basic references are noted. Typical installations under steam generators are shown in Figures 6, 7, and 8. Illustrations of "corner suspension firing" and its application to a large utility type steam generator are shown in Figures 4 and 9. A schematic illustration of one typical continuous flow incinerator furnace for "deep bed burning" of mixed municipal refuse is shown in Figure 5.

Of the many aspects which must be taken into account when considering burning salvage refuse fuels in combination with fossil fuels in existing or proposed steam generators, the influence on stack emission is of prime significance.

It is recognized that control of stack emission should first be exercised at the source. If particulate entrainment is minimized at the source, the burden on the air pollution control device and appurtenances, gas enclosures, boiler surfaces, etc. are reduced. Therefore, an ideal system would afford complete combustion of the fuel and avoid entrainment of solids in the gas stream; having all of the residue discharged at the bottom of the furnace.

Although all present stoker systems have substantially less particulate entrainment than "suspension firing" (e.g. pulverized coal) the "ideal circumstance" of no entrainment may only be approached.

The method by which the fuel is introduced, the ability to control uniformity of fuel distribution and combustion air distribution, the fuel burning rate, uniformity of fuel characteristics and fuel size consist, and the fuel bed depth on a grate, all have a bearing on the quantity and nature of the particles entrained in the rising gases.

The mass burning stoker types characteristically release lesser quantities of particulates in the gas stream. Until the advent of the more stringent air pollution criteria in recent years many of these installations were capable of operation within the recommended ASME guidelines although not equipped with mechanical dust collectors. The thin burning (semi-suspension) spreader stoker applications were also able to comply, when the steam generating units were equipped with efficient multi-clone mechanical collectors. However, most "suspension fuel firing" units required application of electrostatic precipitators in view of the characteristic 75% to 95% ash entrainment.

The mass burning multiple underfeed stoker types accommodate coarse fuels with top size of 2", require high ash fusion temperature and low iron content. Fuel bed thickness is maintained at 15" to 18" in the volatilization zone of the grates.

The mass burning overfeed stoker types accommodate friable fuels with top size of 1-1/2", require uniform size consist and distribution across the fuel hopper. The fuel bed thickness would range 3" to 10" at the fuel gate.

The thin burning (semi-suspension) spreader stoker types accommodate a wide range of the smaller fuel sizes with the top size limited to 1-1/2". Considerable spread in size consist is necessary for satisfactory fuel distribution longitudinally in the furnace. Fuel bed thickness would range 2" to 5" depending on the air permeability of the ash bed.

BENEFICIATED, CONTROLLED QUALITY, SALVAGE FUEL CUBETTES PREPARED TO SUIT THESE STOKER TYPES COULD BE AN ECONOMICALLY ATTRACTIVE, LOCALLY DERIVED, LOW SULFUR, LOW CONTAMINANT, SUPPLEMENTARY FUEL SOURCE AND SHOULD ASSIST IN A PROGRAM TO IMPROVE THE QUALITY OF STACK GAS EMISSION.

References: STEAM - its generation and use. 37th Edition
The Babcock and Wilcox Company, New York 1963

COMBUSTION ENGINEERING - Glen R. Fryling
Combustion Engineering Inc., New York 1966

FIGURE 1
SCHEMATIC MASS BURNING OVERFEED STOKER

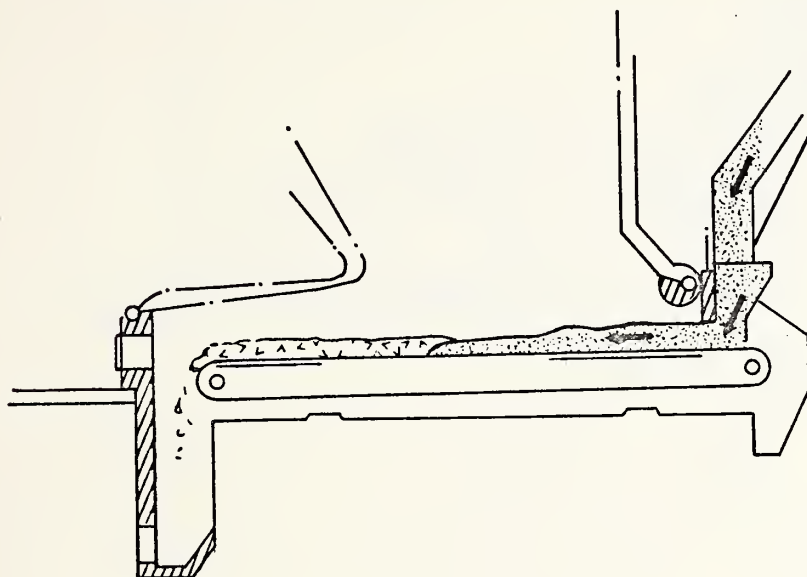
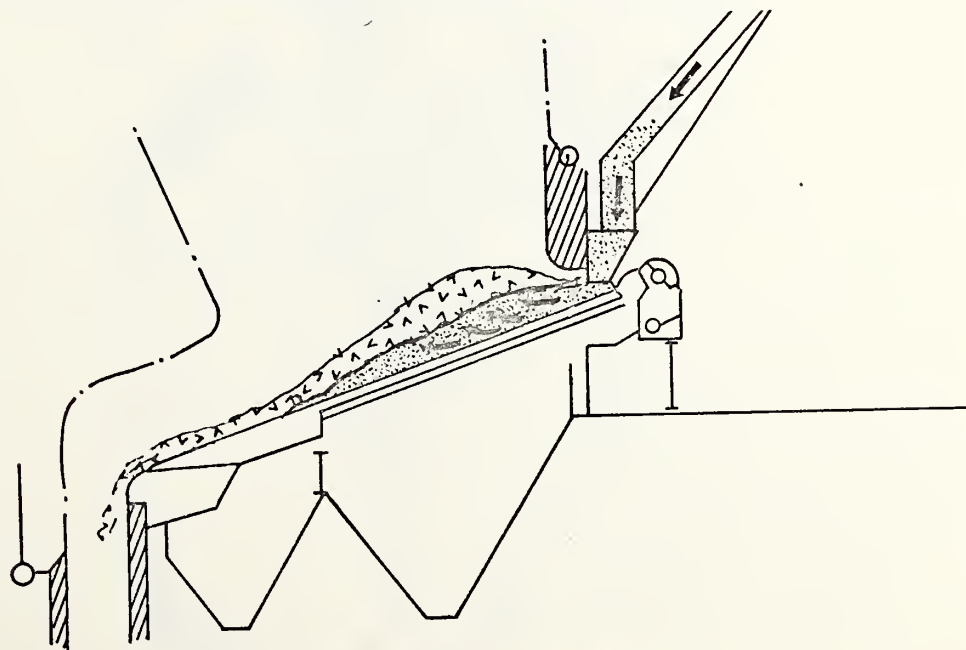


FIGURE 2
SCHEMATIC MASS BURNING MR UNDERFEED STOKER



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FIGURE 3

SCHEMATIC THIN BURNING (SEMI-SUSPENSION) SPREADER STOKER

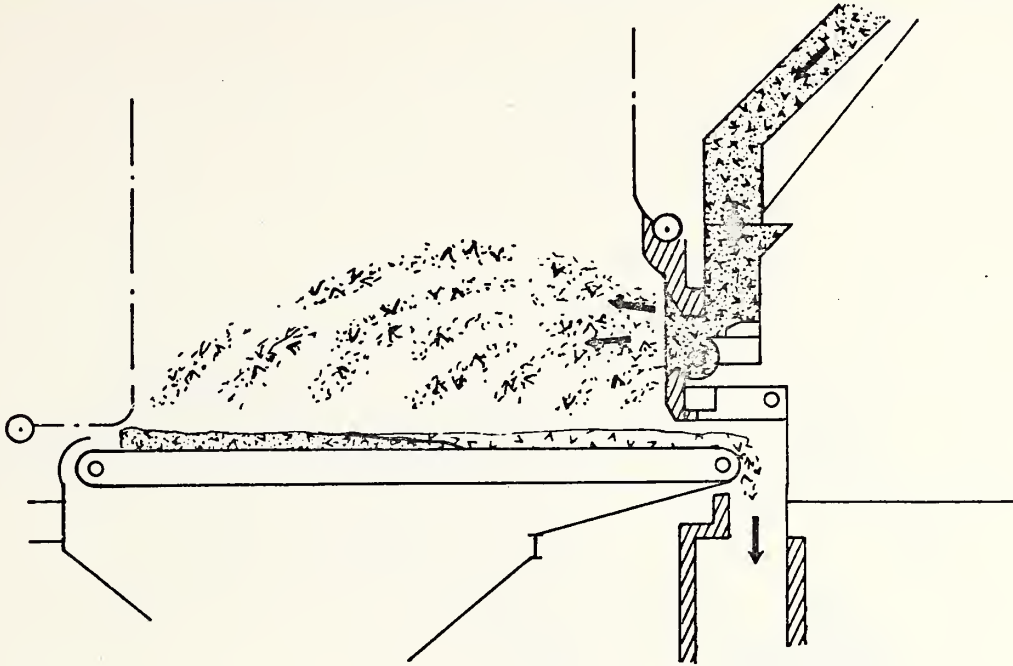
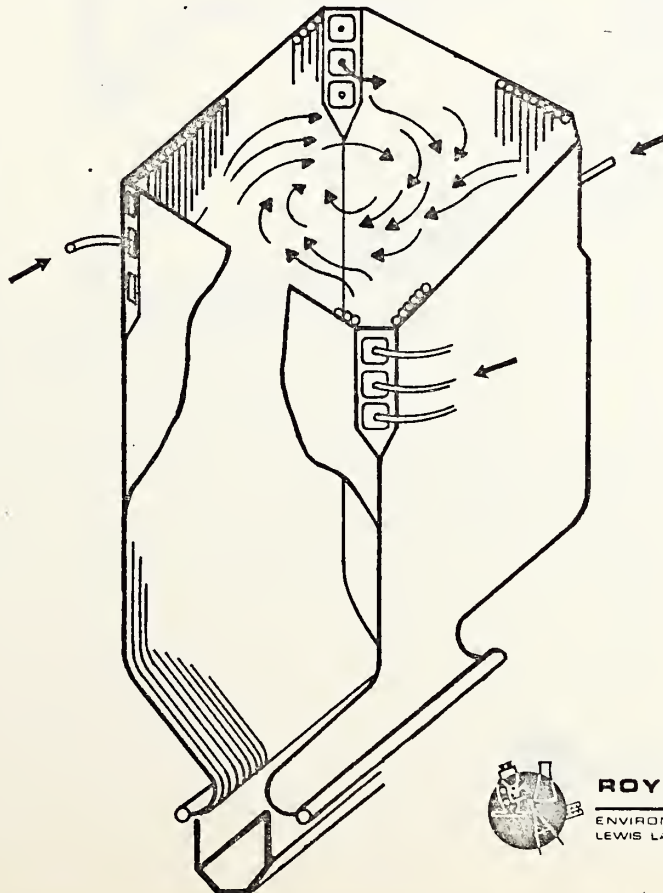


FIGURE 4

SCHEMATIC CORNER-SUSPENSION FIRED FURNACE

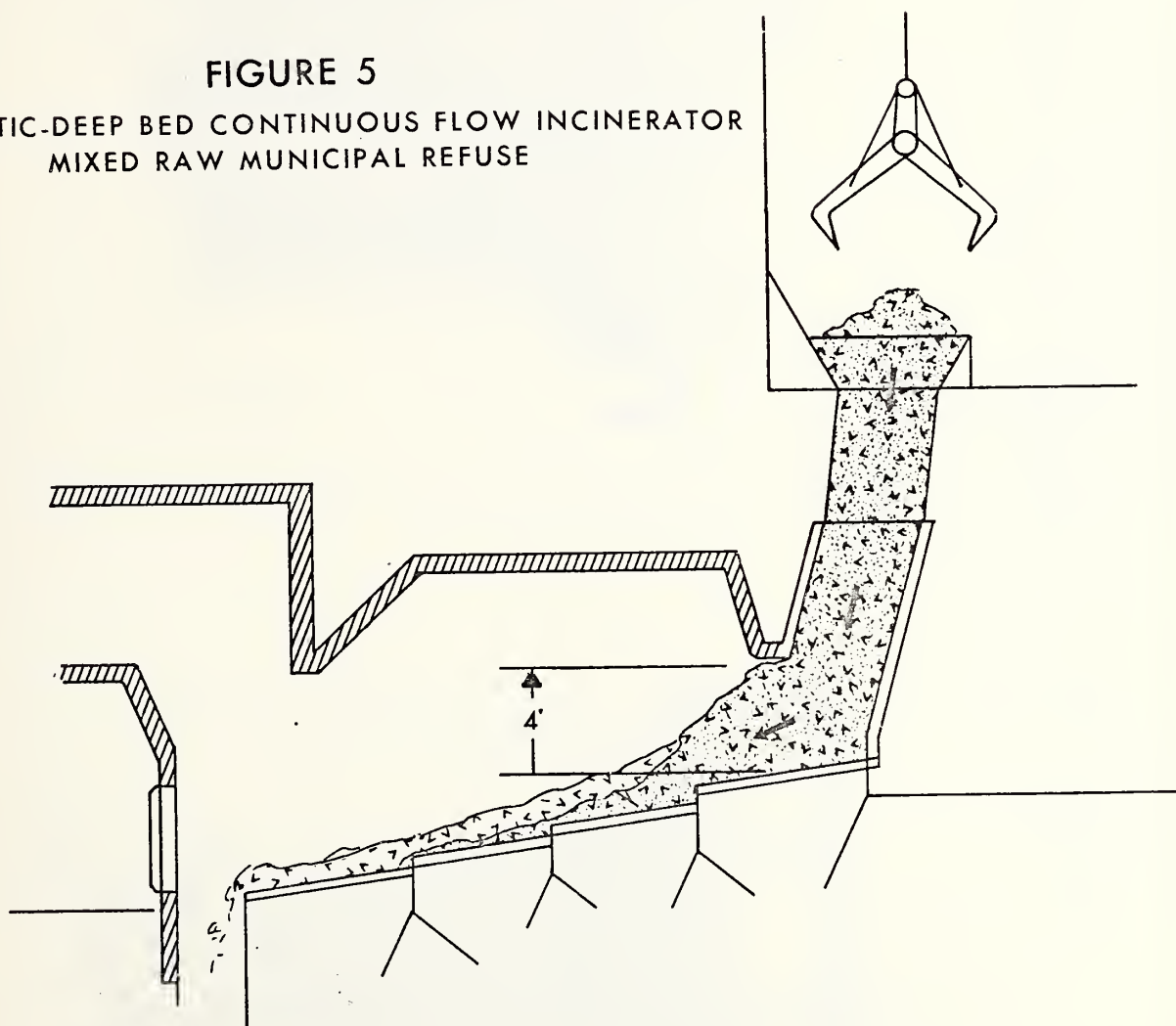


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FIGURE 5

**SCHEMATIC-DEEP BED CONTINUOUS FLOW INCINERATOR
MIXED RAW MUNICIPAL REFUSE**



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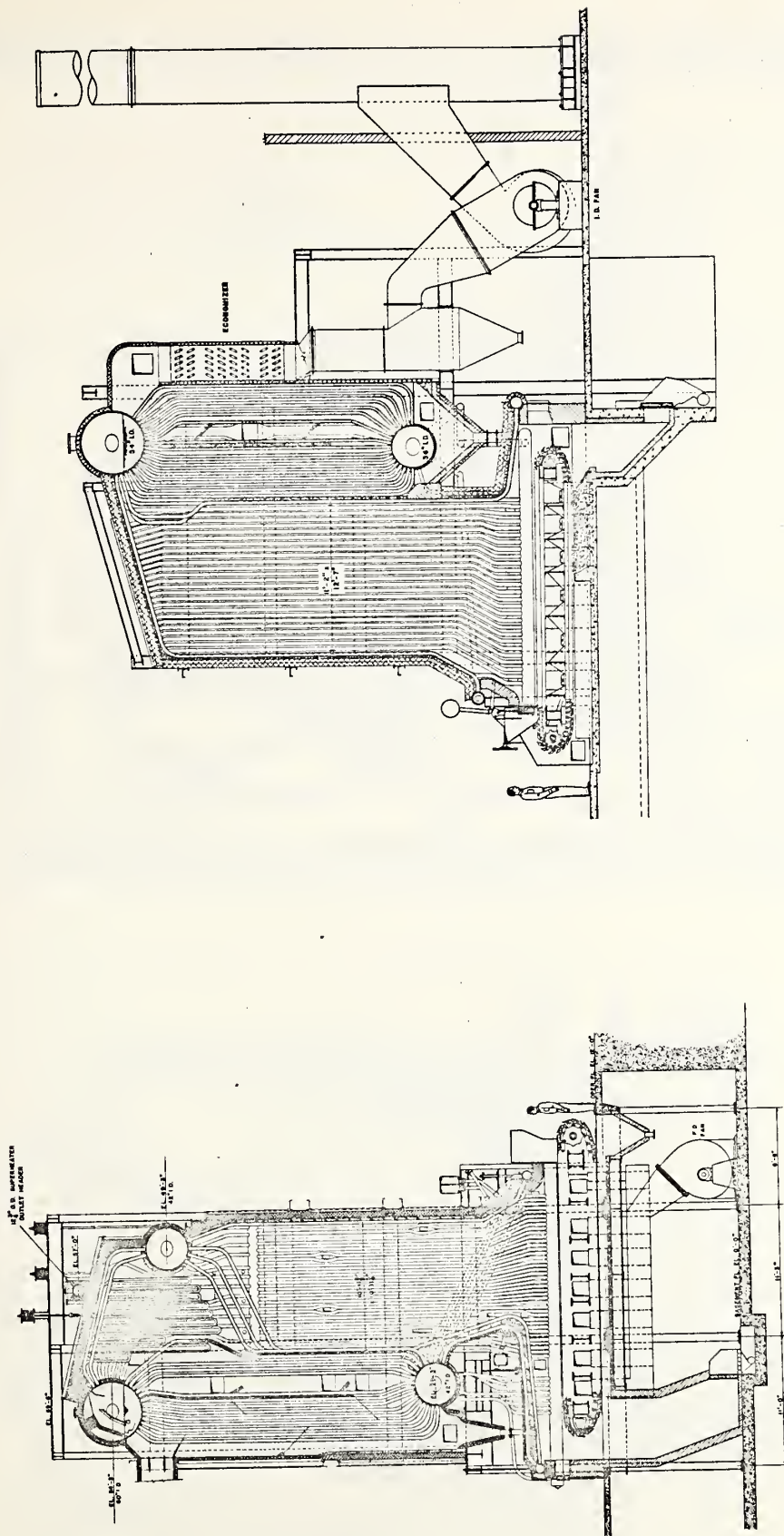


FIGURE 6
TYPICAL INSTALLATIONS OF MASS BURNING OVERFEED STOKER FIRED STEAM GENERATORS

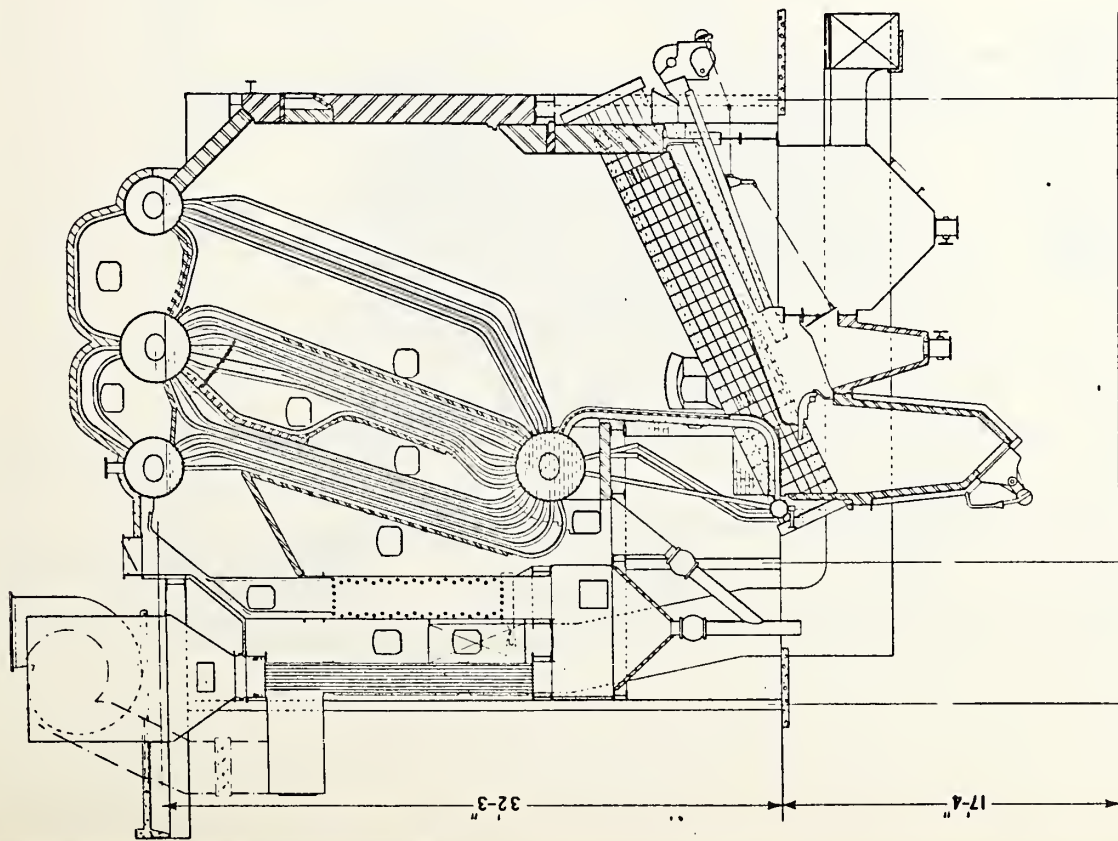
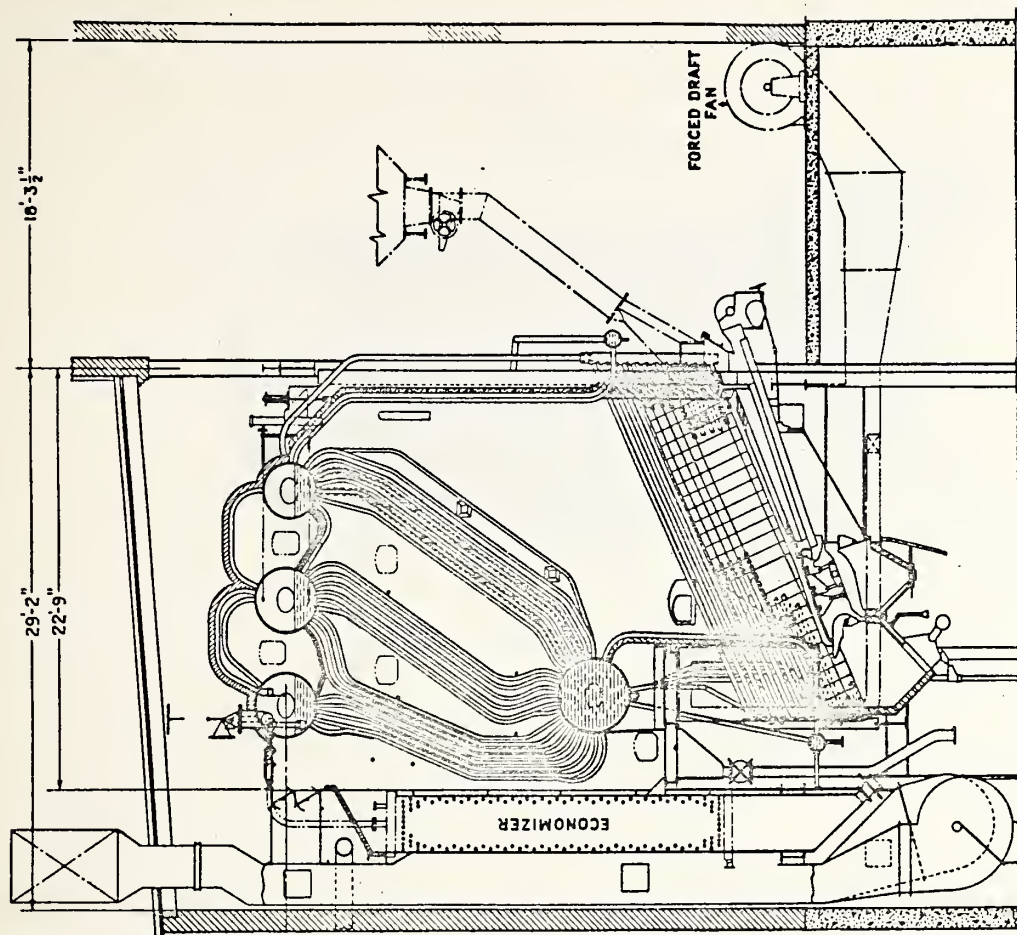


FIGURE 7

TYPICAL INSTALLATIONS OF MASS BURNING MR UNDERFEED STOKER FIRED STEAM GENERATORS

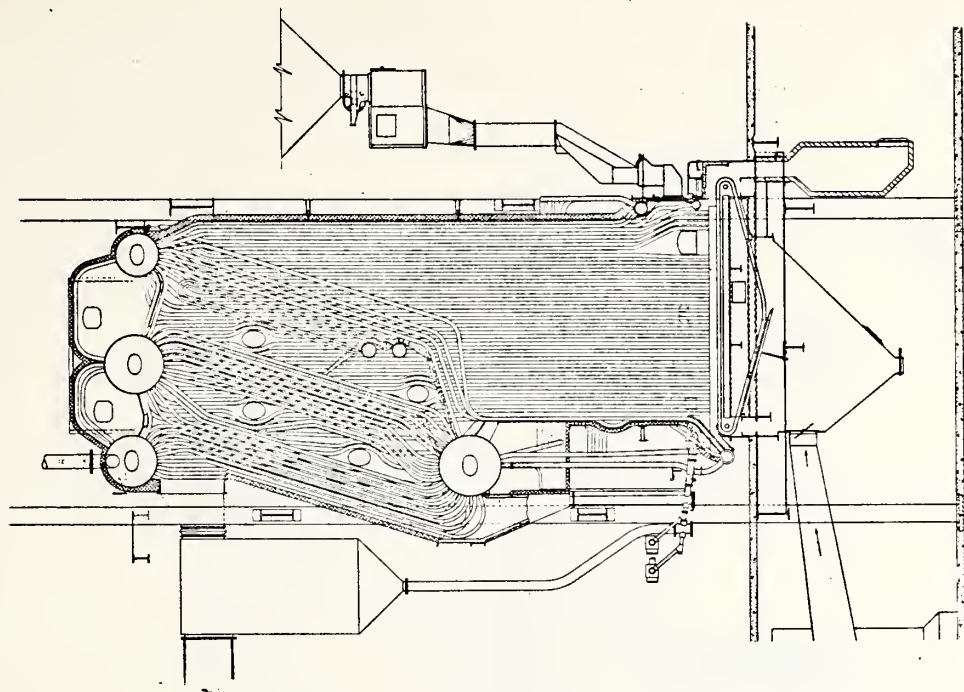
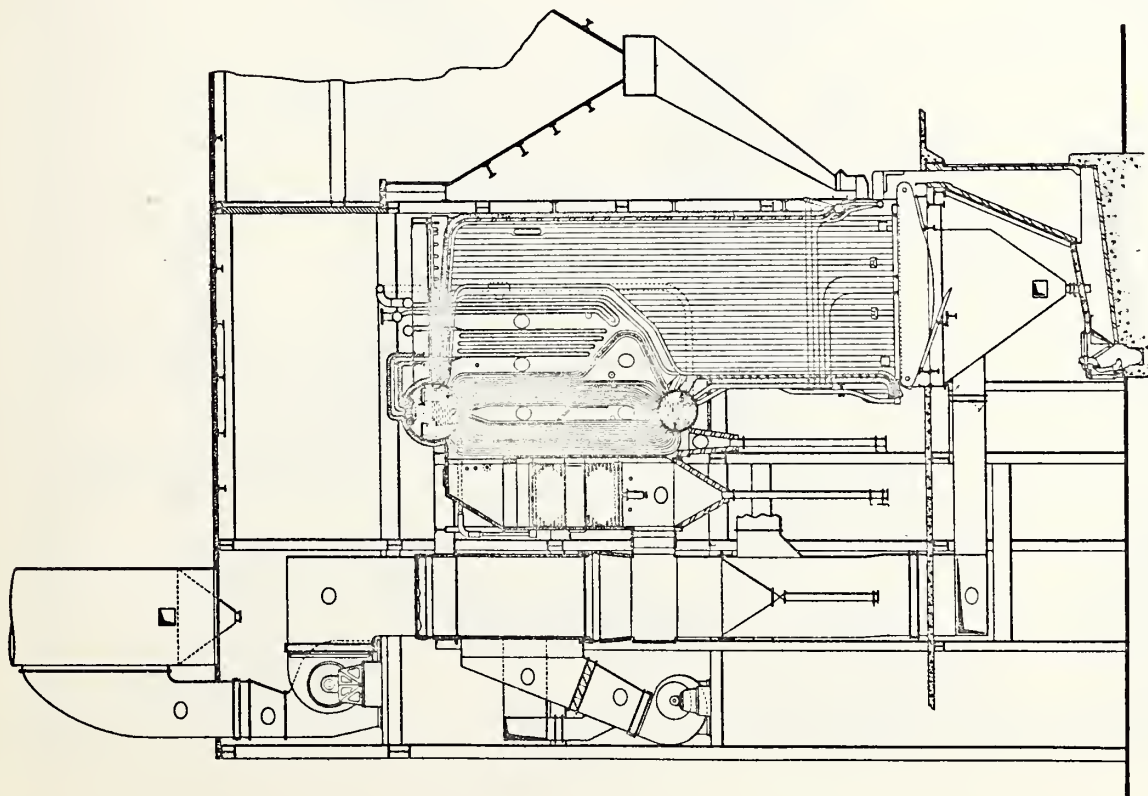


FIGURE 8

TYPICAL INSTALLATIONS OF THIN BURNING (SEMI-SUSPENSION) SPREADER STOKER FIRED STEAM GENERATORS

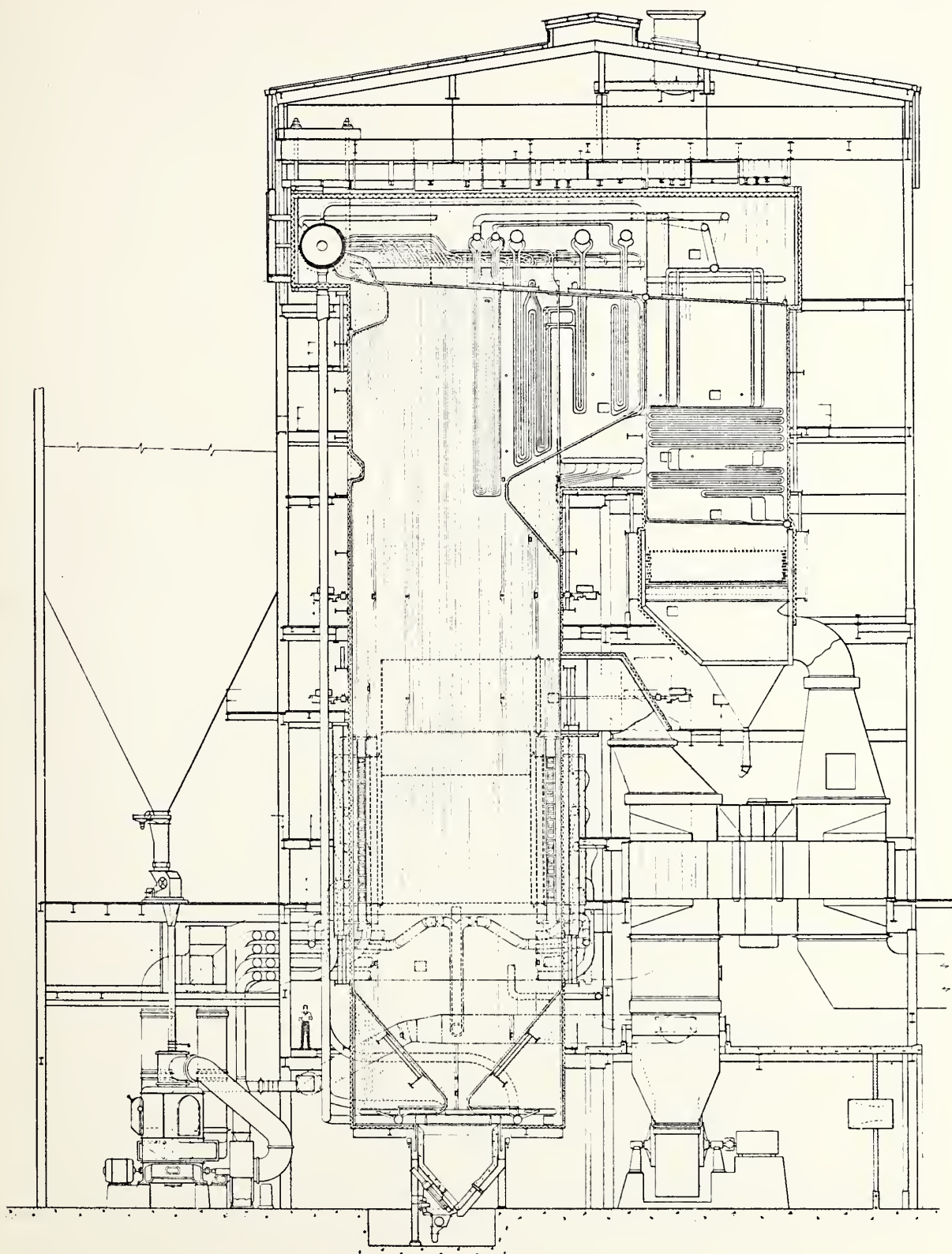


FIGURE 9

TYPICAL INSTALLATION CORNER SUSPENSION FIRED STEAM GENERATOR





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